Nevada Irrigation District

Staff Report

TO: Board of Directors

FROM: Doug Roderick, P.E., Director of Engineering

DATE: November 13, 2023

SUBJECT: **Plan for Water – Strategy Options Discussion**

ENGINEERING DEPT

RECOMMENDATION:

Review and discuss various strategy options for reducing demands and increasing water availability and provide input.

BACKGROUND:

This is Stage 8 of the Plan for Water (PFW) process. The purpose of this stage is to evaluate different strategies that benefit the District's water supply. Some strategies are intended to provide a reduction of predicted unmet demand, while other strategies support one or more of the Board's strategic priorities. This is not an exhaustive list and it is intended to allow for the Board and the public to provided input on each strategy and the evaluation categories. The preliminary strategy options presented are a result of input from the Board, the public, and staff during the PFW process. Some of the options that are presented will benefit from additional modelling and some of the options presented do not lend themselves to modelling.

The average unmet demands in the selected modeling scenarios determined at the October 12, 2023 PFW meeting are the following:

Scenario #1 Dry climate, High Demand: 43,000 Ac-Ft Avg Unmet Demand
Scenario #5 Median climate, Median Demand: 19,500 Ac-Ft Unmet Demand
Scenario #9 Wet climate, Low Demand: 10,500 Ac-Ft Unmet Demand
Scenario #10 Baseline: 9,000 Ac-Ft Unmet Demand

Attached is the initial strategy option spreadsheet, which identifies various options for reducing demands and increasing supplies for the Board to consider. Within the spreadsheet, the options have been broken down into several areas for further

discussion. Below is a summary of the components that was developed for each option:.

Strategy Option: This is the type of option being considered.

Description: This is the description of the option being considered along with additional information and some assumptions considered.

Cost: This is the cost to implement the option. Some have specific cost estimates where other options the cost is discussed more as impacts to costs. All cost analysis are very high level and would require refinement if futher considered. For treated and raw water customer costs, a simplestic approach of spreading costs based on percentage of usage per customer class was used, which is approximately 93.9% for raw water and 6.1% for treated water. Options with costs spread out over 30 years did not include any calculated interest.

Change in Acre-Feet: This is the potential change in acre-feet that an option could contribute. It may be a reduction in demand, or an increase in supply.

Legal Considerations: This is the potential for litigation relating to implementation of the option.

Environmental: This is the potential impacts relating to environmental concerns. Comments could include both positive and negative impacts. Some options have both.

Operational Impacts: This is the potential effect on operations of the water system resulting from implementation of the option.

Feasibility: This identifies if implementation of an option is feasible. Some options may be feasible implementing but may be cost prohibitive for the amount of reduced demand or increased supply.

Customer Impacts: This identifies potential impacts to District customers, and options can have both positive and negative impacts. Some impacts can be temporary during implementation.

Risk: This is the potential risk to the District in implementing the option.

Other Considerations: This has additional information relating to the option.

The goal for this workshop is to discuss various strategic options, the effort needed to implement them and the anticipated improvement in either demand reduction, increased supply, or improvement to watershed health and to consider which

options should be modeled. The results of the modeling will be presented at a future PFW workshop.

BUDGETARY IMPACT: None.

ATTACHMENTS (1)

- Strategy Option Spreadsheet

DR

Strategy Option	Description	Cost	Change in Acre-Feet	Legal Considerations	Environmental Impacts	Operational Impacts	Feasibility	Customer Impacts	Risk	Other Considerations
Operations:										
1. Carryover Storage	Reduce targeted carryover storage below minimum for health and safety and current instream flows. Model was run to maintain a 77,000 Ac-Ft carryover. This amount is approximately equal to existing instream flow requirements and health and safety flows (treated water, in home raw water use, and stock water). Reducing carry over storage requirements in the model would reduce predicted unmet demands depending on year types and increases likelihood of increased implementation of the Drought Contingency Plan.	Variable impact to revenue based on water year type and drought contingency implementation stage. Revenue will be impacted due to reduced water sales and hydropower generation. Full cost impact to be determined based on modelling results and associated unmet demands.	Up to a maximum of 30,000 Ac-Ft based water year type. Need to confirm with modelling.	1. Litigation regarding water code. 2. Additional CEQA analysis due to potential species impacts. 3. Prop 218.	1. Reduced carry over storage could result in temperature issues in a multi-dry year scenario and has the potential to impact multiple species due to a lack of water. 2. Could increase fire hazard due to reduction in irrigated properties.	1. Increase labor costs due to drought contingency implementation. 2. Impacts to recreation. 3. Hydro power generation.	1. This option is feasible but is a high risk option due to the potential for severe water shortages in a multiple dry-year scenario.	1. Rates will need to be increased to offset revenue reductions in dry years. 2. Less water available for purchase/use will impact individual customers.	1. Inadequate refill of reservoirs depending on hydrology. 2. Implementation of drought contingency plan on annual basis. 3. Reduced revenue. 4. This option has a high risk associated with impacting water deliveries under a multiple dry year scenario.	1. Current model runs used carryover storage target of the minimum 77,000 Ac-Ft for health and safety. 2. There is no specific regulation that requires the District to maintain the minimum carryover storage. 3. This option can be modelled with reduction in that minimum carryover. 4. Staff would recommend modeling the carryover target to 47,000 Ac-Ft to better understand impacts.
2. Canal Automation	Install automated gates at inlets and measuring stations at outlets. 161 canals at $50,000 per station for head of canal, and $8,000 per station at the end of canals. This option would install automated gates at the head of canals and measuring stations at the end canals to allow for real time operation of the canal system.	$9,338,000 (cost to implement including labor). ($1,679 per raw water customer; $28 per treated water customer). Future operational costs could be lower due to decreased labor for operation of canals.	2,421 Ac-Ft to 6,052 Ac-Ft. This is 2% to 5% reduction in raw water deliveries (2002 Yr).	1. To be determined on a canal by canal basis regarding installation of facilities on private property.	1. Decreased water diversions will allow more runoff into natural system which is a positive in some locations. 2. Negative impacts to some local drainages due to less tail water being released from the system.	1. Reduced labor due to improved efficiencies in operations of canals. 2. Increased ability to collect data.	1. This is a feasible option but does not significantly change unmet demands. 2. Most likely would have to be implemented in phases over time. 3. Grants may be available to offset costs associated with automation	1. Potential to improve delivery to customers. 2. Potential to impact delivery to customers.	1. Failures of gates causing overtopping or drying of canal. 2. Need to resolve power issues.	1. Due to the varying lengths of District canals, it can take hours/days for water to move through the system. Changes made with the automated gates to reduce flows at the end will take time. 2. Canals may go dry if demand goes up with the canal before the gate can modulate the changes. 3. Some canals spill is then utilized for another canal, so the operation becomes complex and the efficiencies are reduced. 4. Will not significantly reduce unmet demands but does address other District Strategic Priorities.
3. Metered Raw Water Accounts	Install mag meters on all existing raw water connections to measure actual usage. Cost of mag meter is $300 for up to 1-inch service. There are 5,230 accounts requiring installation. For this discussion, it is assumed that the existing open canal system is in place and that meters are connected to customer service locations.	$1,569,000 plus approximately $5.5 M in installation costs ($1,353 per meter). Additional costs for meters over 1-inch.	0 Ac-Ft to 1,210 Ac-Ft. This is 0% to 1% of raw water deliveries (2022 Yr). Implementation has potential to actually increase usage.	1. Will impact Prop 218 analysis due to redistribution of revenue collection by customer class.	1. Minimal	1. Increased labor costs to maintain and read meters. 2. Changes in service locations to accommodate full service outlet. 3. Meters prone to plugging. 4. Increase raw water conservation opportunities.	1. This option is not considered feasible due to concerns with clogging of the meters and accurate readings. 2. Not all raw water services may be conducive to mag meter installation depending on canal depth and service pipe elevations. 3. May need to increase water depths in canals to ensure full pipe through meter for accurate reading.	1. Will increase rates due to maintenance and replacement costs associated with meters. 2. Will modify rate structure and redistribute costs based on actual volume which may have a potential increase in customer maintenance and volumetric charges for some customer classes.	1. Increased plugging of meters requiring more labor costs. 2. Replacement costs of equipment.	1.This item is not anticipated to reduce the overall demand significantly. 2. It would improve the understanding of how much water the customer is using refine water needed to meet demand. 3. Increase conservation opportunities for raw water. 4. This option more feasible if installed within closed (piped) system. 5. Recommend continuing to monitor meter advancements, as increasing metering and embracing new technology is a District Strategic Priority.
4.Rotation of Raw Water Accounts	Rotate water deliveries to every other day for raw water customers. This would involve locking out raw water customers every other day to adhere to the rotation. For this discussion, it is assumed that all raw water customers are required to rotate.	Reduction in revenue up to $4,875,290. This reduction based on 50% reduction in 2022 raw water revenue. Assume no increased rates. Substantial increased in labor costs to implement this program.	6,052 Ac-Ft to 12,104 Ac-Ft. This is 5% to 10% of raw water deliveries (2022 Yr).	1. Litigation regarding water code	1. Decreased water diversions will allow more runoff into natural system. 2. Impacts from reduced irrigated area.	1. Substantial increased labor costs to implement program.	1. This option is not feasible due to overall length of canals to be managed. 2. Extremely labor intensive and would require additional staff to implement. 3. Program would require increases in rates similar to drought contingency plan.	1. Limiting water availability. 2. Economic impacts to agriculture customers. 3. Paying more for less water. 4. Would reduce ability to grow crops.	1. Large revenue reduction. 2. Substantial increase in labor costs.	1. This option may not be legal to implement per water code and the District's water rights. 2. This option is not feasible to implement.
Watershed Management										
1. Meadow Restoration within District lands	Meadow restoration within properties owned by District. Current English Meadow Restoration Project is anticipated to increase meadow storage to a probable maximum around 450 Ac-Ft. Costs for increased flow is approximately $3,742 per Ac-Ft for English Meadow Restoration. English Meadow is the largest meadow within District owned property. Two smaller meadows have been identified within District owned property. These smaller meadows will yield additional natural storage to the system when completed.	Estimate $3,742,000 for the three meadow projects ($149 per customer both treated and raw). Grants also would help offset costs.	Three separate meadows totaling approximately 1,000 Ac-Ft of natural storage capacity.	1. CEQA required.	1. Improvement to watershed health and fire resiliency. 2. Temporary impacts to biological resources and water quality. 3. Potential impacts to cultural resources.	Minimal	1. This option is feasible with ongoing partnerships and grants to offset costs. 2. Some limitations due to property ownership.	Minimal	Reduces fire and improves water quality and supply.	This option is being currently being undertaken by the District. Not anticipated to reduce the overall unmet demand significantly but does support current District Strategic Priorities.
2. Forest Management (fuel reduction)	Reduce forest density to reduce wildfire risk, improve forest health, increase water yield and reduce drought-induced tree stress. Fuels reduction activities treat overly dense forest areas, creating defensible space throughout NID's critical water system infrastructure in landscapes ranging from high alpine tree and meadow communities to low-elevation oak woodlands. NID owns approximately 7,000 acres of forested watershed lands within a 70,000 acre watershed under diverse ownership.	At an average of $2,650 per acre ($18.5 M), depending on slope, location, density, etc. ($736 per customer both treated and raw)	Estimates vary depending on location, slope, vegetation type, etc.	1. CEQA required.	1. Improvement to watershed health and fire resiliency. 2. Temporary impacts to biological resources and water quality. 3. Potential impacts to cultural resources.	1. Reduce wildfire risk. 2. Increased water supply.	1. This option is feasible with ongoing partnerships and grants to offset costs. 2. Some limitations due to property ownership.	1. Could result in rate increases if grant funding is not received. 2. Could also reduce future rate impacts by decreasing wildfire risk.	Low risk option.	Advance ongoing collaborations with other agencies and private property owners within the 70,000 acre watershed. Not anticipated to reduce the overall unmet demand significantly but does support current District Strategic Priorities.
Canal Improvements										
1. Encasement of Canals	Encase canals with pipes to reduce loss due to seepage, leaks and evaporation. Assume avg 30-inch pipe diameter at $25 per diameter inch or $750 per foot and 427 miles of canal to encase.	$1,690,920,000 for construction. ($10,137 per year for 30 years for raw water cutomers; $172 per year for 30 years for treated water customers). Additional costs associated with environmental analysis and permitting. Would be substantial reduction in Operations and Maintenance Costs	12,104 Ac-Ft. This is 10% of raw water deliveries (2022).	1. CEQA required. 2. CEQA litigation.	1. Potential impacts to biological resources. 2. Potential impacts to archeological resources. 3. Potential impacts to cultural resources. 4. Potential impacts to trail recreation.	1. Reduction in operation and maintenance of facilities	1. This option is not feasible as encasement of all canals could not be supported by rates for the amount of Ac-Ft saved. 2. Encasement in selected canals is feasible and is currently being undertaken within existing capital improvement program.	1. Increase in water availability. 2. Eliminated cleaning/plugging of services and irrigation systems.	1. Once completed, risk for raw water system would be drastically lower.	This option is being undertaken by the District in select locations where warranted.

Strategy Option	Description	Cost	Change in Acre-Feet	Legal Considerations	Environmental Impacts	Operational Impacts	Feasibility	Customer Impacts	Risk	Other Considerations
Operations:										
2. Lining of Canals	Shotcrete/line canals including wire mesh to reduce seepage and leaks. Assume $315 per foot and line 427 miles of canal	$710,186,400. ($4,258 per year for 30 years for raw water customers; $72 per year for 30 years for treated water customers. Would be reduction in Operations and Maintenance Costs	6,052 Ac-Ft. This is 5% of raw water deliveries (2022 Yr).	1. CEQA required. 2. CEQA litigation.	1. Potential impacts to biological resources. 2. Potential impacts to archeological resources. 3. Potential impacts to cultural resources. 4. Potential impacts to trail recreation.	1. Reduction in operation and maintenance of facilities	1. This option is not feasible as lining of all canals could not be supported by rates for the amount of Ac-Ft saved. 2. Lining in selected canals is feasible and is currently being undertaken within existing capital improvement program.	1. Increase in water availability. 2. Some reduction in cleaning/plugging of services and irrigation systems.	1. Once completed, risk for raw water system would be reduced. 2. Property damages due to leakage would be lowered.	This option is being undertaken by the District in select locations where warranted.
Storage Augmentation										
1. Sediment Removal from Existing Reservoirs										
A. Rollins	Rollins has lost capacity of 10,848 Ac-Ft (16%). Remove sediment from reservoir. $26.32 to $46.35 per CY. This cost per CY is based on Loma Rica Reservoir and Combie Reservoir sediment removal costs, which required minimal trucking and placement of material. It is assumed that dry sediment material will be removed. It would be anticipated that work at Rollins would be higher due to trucking costs.	$460,942,368 to $811,723,296 plus generation and recreation revenue impacts for multiple years. ($2,763 to $4,866 per year for 30 years for raw water customers; $47 to $82 per year for 30 years for treated water customers). New revenue stream for lease of property on Bear River arm for commercial operations.	10,848 Ac-Ft	1. CEQA required. 2. CEQA litigation. 3. NEPA/FERC.	1. Potential impacts to biological resources. 2. Potential impacts to cultural resources. 3. Potential impacts to reservoir recreation.	1. Reservoir to be drawn down to remove dry sediment. 2. Impacts to recreation, hydro power generation and storage for multiple years	1. Not feasible as costs too high for the amount of storage recovered. 2. Substantial impacts to reservoir storage. 3. Impacts to recreation and hydro power revenue.	1. Recreational impacts due to lowered reservoir levels. 2. Potential for raw/treated water conservation requirements due to reduced storage, dependent on water year type. 3. Substantial increase in rates to pay for project. 4. Increased water availability	1. Reduction in storage capacity for multiple years. 2. Hydro power generation impacts. 3. Recreation impacts.	The material located on the greenhorn side is of very little quality for resale purposes. Material on the Bear River arm (steephollow) does have marketable material. The District has already performed an CEQA analysis and secured right of way to ingress/egress to allow for material to be commercially removed and processed. This would be a new revenue stream for the lease rights and gain back storage within Rollins. This would be done over a 30 to 50 year timeframe.
B. Combie	Combie has lost capacity of 2,765 Ac-Ft (50%). Remove sediment from reservoir. $26.32 to $46.35 per CY. This cost per CY is based on Loma Rica Reservoir and Combie Reservoir sediment removal costs, which required minimal trucking and placement of material. It is assumed that dry sediment material will be removed. It would be anticipated that this larger volume of sediment would need to be trucked offsite increasing costs.	$117,487,615 to $206,986,655 plus generation and recreation revenue impacts for multiple years. ($704 to $1,241 per year for 30 years for raw water customers; $12 to $21 per year for 30 years for treated water customers). Potential new revenue stream for lease of property for commercial operations.	2,765 Ac-Ft	1. CEQA required. 2. CEQA litigation. 3. NEPA/FERC.	1. Potential impacts to biological resources. 2. Potential impacts to cultural resources. 3. Potential impacts to reservoir recreation.	1. Reservoir to be drawn down to remove dry sediment. 2. Impacts to recreation, hydro power generation and storage for multiple years	1. Not feasible as costs too high for the amount of storage recovered. 2. Substantial impacts to reservoir storage. 3. Impacts to recreation. 4. Limited impacts to hydro power revenue.	1. Recreational impacts due to lowered reservoir levels. 2. Potential for raw/treated water conservation requirements due to reduced storage, dependent on water year type. 3. Substantial increase in rates to pay for project. 4. Increased water availability	1. Reduction in storage capacity for multiple years. 2. Recreation impacts. 3. Some impacts to hydro power generation.	Some material within combie sediment may be marketable. Previously had commercial operation in upper end of reservoir. No specific analysis or CEQA work has been completed. Not all areas of sediment would have commercial value. Potential new revenue stream for lease rights and gain back some storage with Combie. This would done over a 30 to 50 year timeframe.
C. Scotts Flat	Scotts Flat has lost capacity cf 5,404 Ac-Ft (11%). Remove sediment from reservoir. $26.32 to $46.35 per CY. This cost per CY is based on Loma Rica Reservoir and Combie Reservoir sediment removal costs, which required minimal trucking and placement of material. It is assumed that dry sediment material will be removed. It would be anticipated that this larger volume of sediment would need to be trucked offsite increasing costs.	$229,621,364 to $404,365,108 plus generation and recreation revenue impacts for multiple years. ($1,377 to $2,424 per year for 30 years for raw water cutomers; $23 to $31 per year for 30 years for treated water customers). No commercial operation likely.	5,404 Ac-Ft	1. CEQA required. 2. CEQA lawsuits. 3. NEPA/FERC.	1. Potential impacts to biological resources. 2. Potential impacts to cultural resources. 3. Potential impacts to reservoir recreation.	1. Reservoir to be drawn down to remove dry sediment. 2. Impacts to recreation, hydro power generation and storage for multiple years	1. Not feasible as costs too high for the amount of storage recovered. 2. Substantial impacts to reservoir storage. 3. Impacts to recreation. 4. Limited impacts to hydro power revenue.	1. Recreational impacts due to lowered reservoir levels. 2. Potential for raw/treated water conservation requirements due to reduced storage, dependent on water year type. 3. Substantial increase in rates to pay for project. 4. Increased water availability	1. Reduction in storage capacity for multiple years. 2. Recreation impacts. 3. Some impacts to hydro power generation.	No commercial operations would be anticipated for sediment with Scotts Flat Reservoir. The costs to remove this amount do not support implementation.
2. New Storage										
A. Rollins increase in storage of 50,000 Ac-Ft	This option would rise existing dam by 53.5 ft. This would involve the top of the existing embankment would be excavated to allow for an inclined core zone to be constructed. New rockfill section would be placed over the existing downstream rockfill to accommodate the higher dam crest. Costs discussed here are for dam construction only and based work performed by AECOM in 2020. Costs increased to todays dollar by using the ENR CCI. Price per Ac-FT for this option is $5,804.	$290,202,500 plus generation and recreation revenue impacts due to reservoir elevations and flow variations during construction for 4-5 years. ($1,740 per year for 30 years for raw water customers; $29 per year for 30 years for treated water customers).	50,000 Ac-Ft	1. CEQA/NEPA required. 2. Litigation for CEQA/NEPA, waterright hearings/protests, private property acquisition.	1. Impacts to biological resources. 2. Potential impacts to cultural resources. 3. Potential impacts to reservoir recreation.	1. Reservoir drawn down for construction for 4-5 years. 2. Impacts to recreation, hydro power generation and storage.	1.Feasible. Project costs makes this project difficult to construct and may not be able to be supported by rates.	1. Recreational impacts due to lowered reservoir levels. 2. Potential for raw/treated water conservation requirements due to reduced storage, dependent on water year type. 3. Substantial increase in rates to pay for project. 4. Increased water availability and drought mitigation.	1. Reduction in storage capacity for multiple years. 2. Recreation impacts. 3. Some impacts to hydro power generation.	
B. Rollins increase in storage of 76,000 Ac-Ft	This option would remove the existing embankment dam and construct a new roller compacted concrete dam in the same location. Height of this new dam would be 320 feet. Existing dam height is 252.5 feet. Costs discussed here are for dam construction only and based on work performed by AECOM in 2020. Costs increased to todays dollar by using the ENR CCI. Price per Ac-Ft for this option is $9,461.	$709,581,000 plus large generation and recreation revenue impacts for 4-5 years ($4,254 per year for 30 years for raw water customers; $72 per year for 30 years for treated water customers).	76,000 Ac-Ft	1. CEQA/NEPA required. 2. Litigation for CEQA/NEPA, waterright hearings/protests, private property acquisition.	1. Impacts to biological resources. 2. Impacts to reservoir recreation resources. 3. Potential impacts to cultural resources. 4. Temporary impacts to water quality.	1. Empty reservoir for 4-5 yrs for construction with no storage available. 2. No/minimal recreation. 3. No hydro power generation.	1. Project not feasible. 2. Loss of storage for 4-5 years. 3. Substantial impacts to PG&E and potentially PCWA.	1. Raw/treated water customers would be impacted by mandatory conservation requirements due to reduced storage available for 4-5 years. 2. No/minimal recreation would be available during construction. 3. Substantial increase in rates to pay for project. 4. Increased water availability and drought mitigation.	1. No storage available for 4-5 years. 2. No hydro power generation. 3. No/minimal recreational. 4. Heavy winter runoff within watershed during construction.	

Strategy Option	Description	Cost	Change in Acre-Feet	Legal Considerations	Environmental Impacts	Operational Impacts	Feasibility	Customer Impacts	Risk	Other Considerations
Operations:										
C. Rollins increase in storage of 80,000 Ac-Ft	This option would construct a new roller compacted concrete dam downstream of the existing dam. Height of this new dam would be 322 feet. Existing dam height is 252.5 feet. Once the new dam is completed, the existing embankment dam would be breached. Costs discussed here are for dam construction only and based on work performed by AECOM in 2020. Costs increased to todays dollar using the ENR CCI. Price per Ac-Ft for this option is $11,578.	$926,208,000 plus minor generation impacts due to flow variations during construction for 4-5 years. ($5,553 per year for 30 years for raw water customers; $94 per year for 30 years for treated water customers).	80,000 Ac-Ft	1. CEQA/NEPA required. 2. Litigation for CEQA/NEPA, waterright hearings/protests, private property acquisition.	1. Impacts to biological resources. 2. Impacts to reservoir recreation resources. 3. Potential impacts to cultural resources. 4. Temporary impacts to water quality.	1. Small reduction in reservoir storage. 2. Minimal revenue impacts to generation and recreation.	1.Feasible. Project costs makes this project difficult to construct and may not be able to be supported by rates.	1. Recreational impacts due to lowered reservoir levels. 2. Potential for raw/treated water conservation requirements due to reduced storage, dependent on water year type. 3. Substantial increase in rates to pay for project. 4. Increased water availability and drought mitigation.	1. Reduction in storage capacity for multiple years. 2. Recreation impacts. 3. Some impacts to hydro power generation.	
3. Develop new storage facility of 110,000 Ac-Ft located between Rollins and Combie (Centennial)	This option would construct a new roller compacted concrete dam within the Bear River located just upstream of the high water mark of Combie Reservoir. Height of this new dam would be 275 feet. Costs discussed here are for dam construction only and based on work performed by AECOM in 2017. Costs increased to todays dollar using ENR CCI. Price per Ac-Ft for this option is $5,310.	$584,077,620 plus minor generation impacts due to flow variations during construction for 4-5 years. ($3,502 per year for 30 years for raw water customers; $59 per year for 30 years for treated water customers).	110,000 Ac-Ft	1. CEQA/NEPA required. 2. Litigation for CEQA/NEPA, waterright hearings/protests, private property acquisition.	1. Impacts to biological resources. 2. Impacts to river recreation resources. 3. Impacts to cultural resources. 4. Temporary impacts to water quality.	1. Flow reductions during construction of coffer dam and bypass. 2. Impacts to hydro power generation.	1.Feasible. Project costs makes this project difficult to construct and may not be able to be supported by rates.	1. Substantial increase in rates to pay for project. 2. Increased water availability and drought mitigation.	1. Heavy winter runoff within the watershed during construction. 2. Additional facility to maintain and operate.	
Demand Management										
1. Conservation										
A. Drought Contingency Plan	Change threshold triggers to implement drought contingency plan more frequently. This would require reductions (both voluntary and required) in usage on a more regular basis that would reduce demands. Implementation of the drought contingency plan is dependent on customers as well as NID. Reductions identified in plan do not equate to actual 1 t0 1 reductions in water use as the canals still need to be operated to have water available for customers whenever they use the water.	Variable impact to revenue based on water year type and drought contingency implementation stage. Costs for implementing Drought Contingency Plan up to $500,000 annually.	Up to 32,213 Ac-Ft. Up to 25% of demand based on stage implemented (2022 Yr).	1. Litigation relating to water code.	1. Decreased water diversions will allow more runoff into natural system which is a positive in some locations. 2. Negative impacts to some local drainages due to less tail water being released from the system. 3. Less irrigated property.	1. Increase in labor and material costs (re-orificing). 2. Implementation of drought contingency plan more often.	1. Feasible. 2. Impacts to agricultural business.	1. Drought contingency plan increases rates for both treated and raw water customers. 2. Less water available for purchase/use.	1. Increased costs to implement drought contingency plan. 2. Potential reduction in revenue.	
B. Education	Offer more education opportunities for water wise irrigation (both treated and raw). The District currently offers classes and has waterwise information on the website. This option would be to increase the amount of classes and material available to customers to help them improve irrigation efficiencies.	Reduction in revenue of $299,877 (both treated and raw) per year. Increase staff time, potentially additional staff needed	1,289 Ac-Ft. This is based on 1% reduction in system demand (2022 Yr).	None	None	Minimal	1. Feasible.	1. Improve water usage and efficiencies 2. Potential reduction in water bills.	1. Potential reduction in revenue.	
C. Conservation Rebates (tech and equip)	Offer rebates for treated and raw water customers to invest in new and water wise irrigation equipment. The District currently offers rebates for toilet replacement, raw water storage tank and turf removal. This option would add rebate options for items like installation of drip systems and timers, landscape replacement, and rain collection systems that would reduce overall customer demand.	Reduction in revenue of $299,877 (both treated and raw) per year. Increased costs associated with rebates	1,289 Ac-Ft. This is based on 1% reduction in system demand	None	None	1. Some additional labor time to process/approve applications and to ensure compliance.	1. Feasible.	1. Improve water usage and efficiencies 2. Potential reduction in water bills.	1. Potential reduction in revenue. 2. Some increase in labor costs. 3. Increased costs for rebates	
2. Hierarchy for Raw Water Uses	Curtail usage based on crop type/usage. This option would require the Board of Directors to adopt a hierarchy of raw water uses that would be put into effect during certain water year types. This would require extensive work in developing use types that are occurring within a parcel and the amount of each type of use.	Impact to Revenue would be based on developed criteria.	Variable depending on threshold decided	1. Litigation relating to water code.	1. Decreased water diversions will allow more runoff into natural system which is a positive in some locations. 2. Negative impacts to some local drainages due to less tail water being released from the system. 3. Less irrigated property.	1. Additional labor and material costs to implement hierarchy depending on water year type.	1. May or may not be feasible depending on water code and water rights. 2. Labor intensive to confirm crop type/usage for each parcel. 3. Difficult to determine crop type hierarchy.	1. Less water available for purchase/use depending on crop type. 2. Potential impacts to agricultural businesses depending on crop type. 3. Potential increase in rates.	1. May be illegal (water code). 2. Reduction in revenues.	
3. Regulations (treated water)	Water budgets. This option would implement future water budget sooner than required. This would be for treated water customers only. Currently the District meets these future water budgets so overall there would not be any real decrease in the treated water demand.	No anticipated impact to revenue as the District already meets the requirements.	Minimal	1. Litigation relating to regulation implementation.	None	1. Increase communication and labor costs	1. Feasible.	1. Potential monetary penalties for excess water use.	1. Monetary penalties for District for customers using excess water.	
4. Abandon Small Canals with Limited Customers	Abandon canals that have low number of customers or purchase amounts. This option would require the Board of Directors to adopt a criteria involving both the length of canal and number of customers on a canal that would then trigger that the District consider abandoning the canal and no longer serve raw water to those customers. In order for this option to actually reduce demand, it is assumed that the District would not deliver water to the head of the canal and treat the canal as a private conduit.	Impact to Revenue would be based on developed criteria.	Variable depending on threshold decided	1. Litigation relating to water code.	1. Decreased water diversions will allow more runoff into natural system which is a positive in some locations. 2. Negative impacts to some local drainages due to less tail water being released from the system. 3. Less irrigated property.	Decreases labor and maintenance costs	1. Probably not feasible due to legal issues regarding water code and water rights.	1. Loss of raw water supply availability.	1. Litigation relating to water code and water rights.	This option is most likely illegal per our water rights and water code.
5. Reduce Instream Flow Requirements for FERC License	Re-negotiate instream flow requirements for new FERC license. This option would re-open negotiations to the new FERC license instream flow requirements to reduce them depending on water year type. For this option, it is assumed that any reduction in the flow requirements would be available to customers for purchase/use.	Increase to revenue for additional water available for sale. Additional Labor, legal and consulting costs necessary for negotiations.	Would depend based on negotiations	1. Litigation relating to FERC licensing requirements.	1. Biological impacts due to decreased in proposed instream flows.	1. Operation impacts regarding releasing of instream flows	1. Feasible but may be difficult to re-enter negotiations. 2. Would potentially open all items negotiated during process to be up for discussion.	1. Increase availability of raw water for purchase.	1. Re-entering negotiations could change requirements for overall FERC license.	
6. Reduce Irrigation Season										
A. Wet winter delay irrigation start	Delay start of irrigation season by 2 weeks if it is a wet year. This option would require the Board of Directors to approve delaying the start of irrigation season (April 15th) by two weeks depending on a wet water year. This would be done by some pre-determined date so that notification to the customers could be communicated in advance.	$487,529 to $975,058 in raw revenue per year. This is based on 5% to 8.5% reduction in raw water demand (2022 Yr).	6,000 AcFt to 10,000 Ac-Ft	1. Litigation relating to water code.	1. Decrease water diversions will allow more runoff into natural system	Minimal	1. Feasible.	1. Loss of raw water supply when needed for a particular crop type. 2. Difficult for agricultural businesses to plan for upcoming planting year.	Minimal	

Strategy Option	Description	Cost	Change in Acre-Feet	Legal Considerations	Environmental Impacts	Operational Impacts	Feasibility	Customer Impacts	Risk	Other Considerations
Operations:										
B. Dry winter end season early	End irrigation season 2 weeks early if it is a dry year. This option would require the Board of Directs to approve ending the irrigation season (Oct 15th) two weeks early depending on a dry water year. This would be done by some pre-determined date so that notification to the customers could be communicated in advance.	$487,529 to $975,058 in raw revenue per year. This is based on 5% to 8.5% reduction in raw water demand (2022 Yr).	6,000 AcFt to 10,000 Ac-Ft	1. Litigation relating to water code.	1. Negative impacts to some local drainages due to less tail water being released from the system. 2. Less irrigated property.	Minimal	1. Feasible.	1. Loss of raw water supply when needed for a particular crop type. 2. Difficult for agricultural businesses to plan for upcoming planting year.	Minimal	
7. Treated Water System Loss	Improve leak detection practices and develop plan to reduce theft as part of existing Water Audit Requirements. The District currently performs water audit of treated water system on a yearly basis as required by current regulation. This option would utilize leak detection equipment such as acoustic, thermography, tracer gas and ground penetrating radar to help find leaks within the treated water distribution system. Additional methods for reporting and identifying theft of water would be incorporated in a water lost control plan.	Costs associated with water monitoring technology would be $50,000 per year	156 Ac-Ft. This is 2% of treated water demand (2022 Yr).	None	None	1. Minor labor costs for implementing and monitoring. 2. Increased efficiencies in treated water distribution.	1. Feasible	None	None	District currently performs annual audit of treated water system.