Drought Resiliency Using Groundwater Production Wells: Ultraviolet Treatment [redacted] Inactivation

($848,372)

WaterSMART Drought Response Program
Drought Resiliency Project Grant FY2021

BOR-DO-20-F002

Funding Group II

August 4, 2020

Applicant:
Las Vegas Valley Water District

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1. Technical Proposal: Executive Summary

Date: August 4, 2020
Applicant: Las Vegas Valley Water District
Location: 1001 South Valley View Boulevard, Las Vegas, NV 89153 (Clark County)

Project Summary:
[redacted] not being a regulated contaminant in groundwater, the Las Vegas Valley Water District (LVVWD) is not operating 34 groundwater production wells, with a combined capacity of 106 million gallons per day, [redacted] In the proposed project, Drought Resiliency Using Groundwater Production Wells: Ultraviolet (UV) Treatment for [redacted] Inactivation, LVVWD will install and operate five UV systems to effectively [redacted] to the treatment goal of ≤1 MPN/100 mL (below detection) in five production wells in Las Vegas, Nevada. Returning the 34 wells to an operational-ready status will increase the system capacity to produce an additional 10,000 to 18,000 gallons per minute (gpm) of high-quality drinking water for the community's water supply. Reclaiming this lost capacity will build resiliency to drought impacts and serve to protect the community against emergency water-supply shortages. As severe and sustained drought conditions in the Colorado River Basin continue to threaten water supplies and delivery systems, building drought resiliency is a crucial tool to ensure and increase safe and reliable water supplies. LVVWD is a member agency of the Southern Nevada Water Authority (SNWA) and the project is supported by SNWA's Water Resource Plan and Joint Conservation Plan. Both plans prioritize banking conserved water resources and developing temporary supplies to provide flexibility to meet demand or offset reductions.

Length of Time and Estimated Completion Date
The proposed project encompasses equipping five wells between July 2021 and October 2022. All project work will be completed by October 2022.

Federal Facilities
The proposed project is not located on a Federal facility.

2. Technical Proposal: Project Location

The proposed project will service wells located in Clark County, Nevada. A map with the locations of LVVWD's out-of-service wells is included as Appendix A.

3. Technical Proposal: Technical Project Description

[redacted] was detected in two locations (out of 50 distribution sampling locations) in the LVVWD distribution system in August 2018. These [redacted] which discharged chlorinated groundwater directly into the distribution system. Consequently, all 37 production wells that are plumbed to discharge directly into the distribution system were taken offline and have remained offline since these [redacted] except for testing purposes when the water was sent to waste. Since initiating testing of these wells, two wells have maintained non-detect status and [redacted] Since turning these wells off, no [redacted] in the distribution system.

One well was taken out service for mechanical reasons, so there are currently [redacted] Nevada Division of Environmental Protection – Bureau of Safe Drinking Water (NDEP - BSDW) guidelines state that prior to restarting wells discharging directly into the distribution system, effective [redacted] strategies must be demonstrated, [redacted] or maintaining [redacted] with 4-consecutive weekly samples followed by monthly sampling.

In the proposed project, LVVWD will implement a supplemental treatment control strategy for [redacted] restart these wells. Selection of the five wells to equip will be dependent on needs and continued evaluation between now and the time of the award. The specifications in Appendix B depict design specifications for the UV disinfection system for an example well. Variations in design of the low-pressure UV systems will be based on production capacity (e.g., 700-4300 gpm) and water quality (e.g., UV transmittance, need for sand separator/surge tank). The design parameters for the treatment were based on effective doses for [redacted] given in literature [redacted] (which is expected to be similar to [redacted]
The system will have chlorination downstream of the UV reactor in order to maintain free chlorine residual prior to entering the distribution system. The design also considered whether additional equipment is needed to further mitigate the risk of lamp breakage, including a surge tank, desander, isolation valves, and a mercury trap. A lamp break response plan will be designed and implemented. A range for design parameters for the UV system are given in Table 1. More details on the UV system are in Appendix C.

Table 1. Range for design parameters for UV treatment systems

Average Well Flow, Treatment Inlet Flow, and Treatment Outlet Flow	700-4300 gpm
Peak Design Flow	4300 gpm
UV Transmittance	>97%
Iron Content Maximum	0.2 mg
Manganese Content Maximum	0.01 mg/L
Water Temperature	15 to 30 ºC
[redacted]	[redacted]
Validated UV Dose	22 mJ/cm^2
[redacted]	[redacted]
Target Chlorine (Application Post-UV)	1 mg/L

References

[redacted]

[redacted]

4. Technical Proposal: Performance Measures

By installing on-site UV treatment at five groundwater wells, the proposed project presents two crucial performance measures, targeting both quality and quantity.

1. **Effectively maintain non-detection (<1 MPN/100 mL) of [redacted] the produced groundwater (post-UV and post-chlorine).** This treatment goal is consistent with guidance provided in the [redacted] report from the National Academies of Sciences, Engineering, and Medicine (National Academies of Sciences Engineering and Medicine, 2019). Samples will be collected at the same three sampling locations for each production well (raw, post-UV, and post-chlorine) and analyzed [redacted] to NDEP - BSDW guidelines. Sampling frequency is expected to be weekly for the first four weeks of operation and monthly thereafter. The UV reactor installation at the wells will be considered successful if [redacted] <1 MPN/100 mL post-UV and post-chlorination.
2. **Provide additional groundwater production capacity.** Upon demonstration of the first measure, NDEP – BSDW approval will be sought to place the production wells into routine operation, where treated groundwater is discharged directly to the distribution system serving LVVWD customers. Upon completion of the full-scale project, an additional 10,000 to 18,000 gpm of high-quality drinking water will be added to LVVWD's yearly groundwater production capacity. This additional capacity provides drought resiliency, as this groundwater provides an additional resource that is not as drought effected as our surface water sources.

Reference

[redacted]

5. Technical Proposal: Evaluation Criteria

E.1.1. Evaluation Criterion A—Project Benefits

How will the project build long-term resilience to drought? How many years will the project continue to provide benefits?

Water from the Colorado River and Las Vegas Valley groundwater constitute Southern Nevada's permanent water resources, providing the water supply for more than 2.2 million residents and 40 million annual visitors. Las Vegas Valley groundwater, a perennial supply that is replenished each year by natural recharge in the surrounding mountains, is a critical component of Southern Nevada's water resources. Groundwater helps meet peak demands and provides resilience for the community's water supply as it is less susceptible to drought impacts than Colorado River resources. Groundwater; however, is susceptible to contamination that can render it non-potable without expensive treatment or unusable if treatment technology is ineffective. Because of these important factors, groundwater resources must be monitored and protected to ensure its long-term availability as a permanent supply.

LVVWD holds groundwater rights of 40,760 afy which are pumped from the Las Vegas Valley Principal Aquifer (LVVPA) through a network of 62 production wells. Thirty-four of these wells that convey groundwater directly to the water-delivery system have been removed from service [redacted] jeopardizing LVVWD's ability to produce the annual groundwater allocation and limits operational flexibility and capacity of the well system to supply water during peak demands or during emergency conditions.

In addition to the annual groundwater allocation, LVVWD production wells can recover water from the Southern Nevada Water Bank (SNWB), which was created as a temporary resource to supply future demands and address emergency water-supply conditions. SNWB was created by storing treated Colorado River water into the LVVPA using injection wells, and currently stores 345,777 af of recoverable credits. Recovery of this water, which would be in an amount in excess of the annual groundwater allocation, has been impacted [redacted] Full use of LVVWD production wells increases the operational flexibility of the water system and overall capacity. A fully functional well network provides drought resiliency by increasing groundwater production capacity should future constraints occur on the Colorado River supply.

The proposed project of five wells is the first step in a long-term treatment solution that will allow over half of the existing LVVWD production wells to return to an operational-ready status. This will benefit the community immensely by recovering the lost production capacity. It will also provide operational flexibility needed to reliably produce the annual groundwater allocation and recover additional water during drought or emergency conditions that has been stored in LVVPA to create temporary supply composing the SNWB. Based on the lifespan of the UV reactors, this project will provide benefits for 20 years.

Will the project make additional water supplies available? If so, what is the estimated quantity of additional supply the project will provide and how was this estimate calculated? ***Provide this quantity in acre-feet per year as the average annual benefit over ten years.*** **What percentage of the total water supply does the additional water supply represent? How was this estimate calculated?**

The proposed project will provide long-term treatment solutions to allow LVVWD to recover lost production capacity from its well system [redacted]. In considering the long-term goal of returning 34 wells to production, the current system capacity would increase by 10,000 to 18,000 gpm and provide much needed operational flexibility to produce the annual groundwater allocation of 40,760 afy. In addition, recovering the lost capacity will allow LVVWD to recover water from the SNWB in excess of the annual groundwater allocation to supply water during drought and emergency conditions.

The five production wells used in the proposed project have production capacities ranging from approximately 700 to 4,300 gpm. If operated continuously throughout the year, this range equates to an annual production total ranging between 1,130 and 6,935 afy. The combined pumping capacity of the 34 production wells currently [redacted] is 106 mgd and, if operated continuously throughout the month, the wells would have the ability to produce approximately 9,900 af/month. This assumption is based on historical production and permitted water-right diversion rates.

The wells are not expected to be operated continuously for the entire year; however, recovering the lost capacity is critical to providing the operational flexibility needed to produce the annual groundwater allocation and recover water from the SNWB during drought or emergency conditions. There are currently 345,777 af of recoverable credits stored in SNWB. The production capacity of the wells not currently operational is approximately 67 mgd. The increased production capacity that would result if the 34 wells that have been taken out of service were recovered would be 106 mgd, increasing the total well-system capacity to 173 mgd. This would result in an increase of approximately 158 percent from the current 2020 well system capacity.

Provide a brief qualitative description of the degree/significance of the benefits associated with the additional water supplies.
The benefit of increasing well-production capacity to access additional groundwater supplies resulting from this project is significant due to the community's dependence on the Colorado River for in excess of 90 percent of its water supply. The ability to recover water from the SNWB to supply water in excess of the annual groundwater allocation is critical should the Colorado River water supply be disrupted.

Will the project improve the management of water supplies? For example, will the project increase efficiency, increase operational flexibility, or facilitate water marketing? If so, how will the project increase efficiency or operational flexibility?
The long-term treatment solution derived from the proposed project will allow LVVWD to increase operational flexibility by increasing the number of wells available. The operational flexibility of the production-well network allows for better management of the aquifer and pumping responses by increasing the distribution of production across the region. Distributed pumping reduces the impacts of more focused pumping, which results in excessive drawdown in localized areas. Additionally, regained production capacity allows for wells to be taken out of service to perform routine maintenance on the well and pump assembly without jeopardizing delivery of the water supply. Operational flexibility also allows for changing pumping locations should other water-quality issues arise in an individual well, such as an increase in nitrate concentration. This project improves LVVWD's ability to deliver water in periods of drought or Colorado River water delivery disruptions.

What is the estimated quantity of water that will be better managed as a result of this project? How was this estimate calculated? *Provide this quantity in acre-feet per year as the average annual benefit over ten years.*
LVVWD's annual groundwater permit allocation is 40,760 afy. The SNWB currently stores 345,777 af of net recoverable storage credits recharged through the Aquifer Storage and Recovery (ASR) Program. The availability of groundwater resources and increased production capacity allows for more operational flexibility, which is imperative for a drought-stricken community. This estimate was calculated using historical production data, allocated water rights and documented SNWB credits.

How will the project increase efficiency or operational flexibility?
The project will provide information on the applicability of using UV wellhead treatment on LVVWD production wells and will allow the out-of-service wells to return to an operational-ready status. This would increase total well-system capacity and provide additional operational flexibility in managing the community's water resources and water delivery system.

What percentage of the total water supply does the water better managed represent? How was this estimate calculated?
The proposed project is the first step in returning 34 wells currently out-of-service [redacted] back into service with an additional combined production capacity of 106 mgd (9,900 af/month if operated continuous throughout the month). This is an increase of approximately 158 percent over the current 2020 LVVWD well-system production capacity of 67 mgd (6,250 af/month). The 34 wells provide increased operational flexibility with the ability to pump the annual groundwater allocation and recover water from the SNWB under emergency or drought conditions. The water right allocation of 40,760 afy represents approximately 10 percent of the total water supply. The additional capacity could provide up to approximately 30 percent of the water supply using the SNWB and operating the system at full capacity. These estimates were calculated using historical pumping data and diversion rates permitted under the individual water rights assigned to each well.

Provide a brief qualitative description of the degree/significance of anticipated water management benefits.
Water management benefits are twofold: (1) increasing the operational flexibility of LVVWD's groundwater supplies represents a significant step in helping to reduce reliance on Colorado River supplies, and (2) determining the feasibility and reliability of using UV wellhead treatment to bring production wells back into service will an invaluable management tool for utilities across the nation.

Will the project make new information available to water managers? If so, what is that information and how will it improve water management?
Yes, the proposed project will make new information available to water managers regarding the use of UV wellhead treatment technology [redacted] under the conditions specific to Las Vegas Valley and the chemical composition of groundwater in the LVVPA. Extensive field-scale testing will be conducted, significantly contributing to a broad knowledgebase of how best to approach [redacted].

Will the project have benefits to fish, wildlife, or the environment? If so, please describe those benefits.
The project is not anticipated to have benefits to fish, wildlife, or the environment.

If the proposed project includes any of the following components, please provide the applicable additional information:

Wells. —What is the estimated capacity of the new well(s), and how was the estimate calculated? How much water do you plan to extract through the well(s)? Will the well be used as a primary supply or supplemental supply when there is a lack of surface supplies?

Please provide information documenting that proposed well(s) will not adversely impact the aquifer. At a minimum, this should include aquifer description, information on existing or planned aquifer recharge facilities, a map of the well location and other nearby surface water supplies, and physical descriptions of the proposed well(s). If available, information should be provided on nearby wells, aquifer test results, and if the area is currently experiencing aquifer overdraft or land subsidence. Please describe the groundwater monitoring plan that will be undertaken and the associated monitoring triggers for mitigation actions. Describe how the mitigation actions will respond to or help avoid any significant adverse impacts to third parties that occur due to groundwater pumping.
The proposed project equips existing production wells directly connected to the water distribution system. These existing wells have individual production capacities ranging from 700 to 4,300 gpm, based upon historical performance and permitted water-right diversion rates. Water extracted through these wells would be used in conjunction with 28 existing wells that are connected directly to the reservoirs where treatment occurs or provide water for irrigation uses. The annual groundwater allocation the well network can pump from the LVVPA is 40,760 afy. Additionally, SNWB stores 345,777 af of recoverable recharge credits. The well network produces the annual groundwater allocation. This groundwater and Colorado River water diverted from Lake Mead compose the permanent water resources the community relies upon for its water supply. The existing production wells are completed in the LVVPA, which has been monitored for water level trends since the 1940s. Land subsidence in the Las Vegas Valley has been monitored since 1935. The existing wells are constructed with mild or stainless steel, generally between 20-24 inches in diameter, and completed to 800 to 1,300 feet below ground surface.

Prior to 1989, declining water levels and subsidence were of concern in the Las Vegas Valley; however, that year, ASR Program was initiated. Treated Colorado River water injected into the LVVPA to create the SNWB stabilized declining water levels and land subsidence. Groundwater levels subsequently recovered over 100 feet in portions of the Valley. The ASR permits and program are current with an extensive monitoring program in place to observe changes in water levels across the basin. Subsidence monitoring stations located throughout the Valley measure changes in land surface elevation. Recent water levels in the vicinity of the production wells are stable. Subsidence monitoring indicates no current subsidence occurring in LVVWD production areas. An approved NDEP groundwater monitoring plan is in place associated with ASR permits. In addition, the Nevada Department of Water Resources (NDWR) oversees LVVWD water right permits associated with the production wells and the recovery of water from the SNWB.

E.1.2. Evaluation Criterion B—Drought Planning and Preparedness

Explain how the applicable plan addresses drought. Explain whether the drought plan was developed with input from multiple stakeholders. Was the drought plan developed through a collaborative process? Does the drought plan include consideration of climate change impacts to water resources or drought?
LVVWD is a member agency of SNWA, the regional water agency for Southern Nevada responsible for developing and maintaining water resources on behalf of the region. SNWA's Water Resource Plan and Joint Conservation Plan are included as Appendix D of this application. These plans document SNWA's efforts to plan for and respond to drought. SNWA has developed strategies and response efforts to mitigate the extended drought affecting Southern

Nevada. These Plans prioritize banking conserved resources and growing temporary supplies to meet demands or offset potential supply reductions. They also outline several drought response initiatives, including the Colorado River Interim Guidelines, the Colorado River Drought Contingency Plan, adaptive management, and long-term planning with a 50-Year Water Resource Plan. Both Plans were developed with stakeholder input. SNWA's establishing agreement, the Cooperative Agreement, requires preparation of a water resource plan. SNWA considers stakeholder input and periodically holds citizen advisory committee processes to gather input on several initiatives, including water resources. The most recent recommendations adopted by the SNWA Board of Directors were considered in development of the 2019 Water Resource Plan, adopted in November 2019. The Joint Conservation Plan was made available to the public for review and comment, reviewed by SNWA's member agencies, and adopted by members that provide potable water services. The Joint Conservation Plan was accepted by the Nevada Division of Water Resources under Nevada Revised Statue (NRS) 540.141 and approved by Reclamation under the Reclamation Reform Act. Both plans consider the impacts of climate change to water resources.

Describe how your proposed drought resiliency project is supported by and existing drought plan. Does the drought plan identify the proposed project as a potential mitigation or response action? Does the proposed project implement a goal or need identified in the drought plan? Describe how the proposed project is prioritized in the referenced drought plan.

Both plans identify development of alternative water supplies as a goal. Treatment solutions identified through implementation of the proposed project would allow LVVWD to recover well-production capacities [redacted]. The increased daily production capacity would allow access to recover SNWB storage in addition to producing the annual groundwater allocation. The additional production capacity would provide an alternative water source should Colorado River supplies be limited.

E.1.3. Evaluation Criterion C—Severity of Actual or Potential Drought Impacts to be addressed by the Project

Describe the severity of the impacts that will be addressed by the project. What are the ongoing or potential drought impacts to specific sectors in the project area if no action is taken, and how severe are those impacts? Impacts should be quantified and documented to the extent possible.

LVVWD's service area is within a region affected by drought for the past two decades. The service area is also dependent on tourism, as Las Vegas welcomes over 40 million visitors annually. Tourism supports hundreds of thousands of jobs in the area and tens of billions of dollars in spending, according to the Applied Analysis June 2019 Economic Impact of Southern Nevada's Tourism Industry and Convention Sector brief. The brief is included in Appendix E.

Are there public health concerns or social concerns associated with current or potential drought conditions? Does the community have another water source available to them if their water service is interrupted?

The extended drought conditions in the region make long-term water supply planning critical. LVVWD's production wells, when operational, provide an additional high-quality drinking water resource. There is a public health concern associated with the potential [redacted]

[redacted] Without proper treatment, the production wells that discharge directly to the water-distribution system cannot be used. The inability to use these wells reduces the number of available production wells to use in conjunction with treated Colorado River water and reduces operational flexibility. The ability to use the entire production-well network provides additional system capacity to help to offset a decrease in available Colorado River supplies should that occur in the future due to disruption or extended drought. Since 90 percent of the water supply for southern Nevada comes from the Colorado River, the proposed project will provide flexibility to meet demand or offset reductions in Colorado River supply interruption.

Are there ongoing or potential environmental impacts?
No impacts are related to this project.

Are there ongoing, past or potential, local, or economic losses associated with current drought conditions?
LVVWD must diligently plan to meet the community's water resource needs to ensure the long-term economic health of Southern Nevada. This position is documented in "*Potential Impacts of Water Resource Uncertainty in Southern Nevada*" published by Applied Analysis in 2011, included in Appendix E. This study concluded that, "It can be stated with a reasonable degree of certainty that water resource instability, or the expectation that sufficient water resources will not be available to sustain the underlying economy, will have a material negative impact on Southern Nevada's economy and fiscal structure as well as that of the state of Nevada as a whole."

Are there other drought-related impacts not identified above?
It is critical for LVVWD and other SNWA member agencies to collaborate in water resource management and planning to ensure comity among members and minimize the risk of drought impacts that might result in a water-related crisis.

Describe existing or potential drought conditions in the project area. Is the project in an area that is currently suffering from drought or which has recently suffered from drought? Please describe existing or recent drought conditions, including when and the period of time that the area has experienced drought conditions (please provide supporting documentation, [e.g., Drought Monitor, droughtmonitor.unl.edu]).
Per the Drought Monitor (droughtmonitor.unl.edu), Clark County, Nevada has been experiencing drought conditions at least some parts of the year since 2000. Because the average rainfall for the area is only 4.19 inches a year, even minor drought conditions can significantly impact water resources.

The Colorado River meets approximately 90 percent of the community's water needs and the Colorado River is suffering from historic drought. The U.S. Drought Monitor dated July 14, 2020 (https://droughtmonitor.unl.edu/Maps/MapArchive.aspx) demonstrates that the much of the Upper Colorado River Basin, the source of a majority of the Colorado River inflows, is in experiencing Abnormally Dry to Extreme Drought conditions. The U.S. Seasonal Drought Outlook for the period July 16 to October 31, 2020 (https://www.cpc.ncep.noaa.gov/products/expert_assessment/sdo_summary.php) shows drought in the Upper Colorado River Basin persisting.

[redacted]

Colorado River flows during the twenty-year period from 2000 to 2019 were one of the lowest since record-keeping on the Colorado River began in 1906 (See Appendix D Water Resource Plan, Figure 2.1). This is demonstrated by the history of natural flow estimated by the U.S. Geological Survey for the Colorado River at Lees Ferry. The severity of the impact of drought on the Colorado River is further demonstrated by the observed changes in combined storage of the two largest reservoirs on the Colorado River system, Lake Powell and Lake Mead. The combined storage declined by more than 50 percent from 47.59 million acre-feet (maf) on October 1, 1999 to 23.54 maf on October 1, 2019. As of July 12, 2020, Lake Mead storage was 10.516 maf or 40 percent full at an elevation of 1,086 feet above mean sea level. This elevation is below action levels requiring the State of Nevada to make contributions to Lake Mead in order to maintain lake elevations and is within only 11 feet of a shortage declaration in which Nevada's consumptive use will be reduced by 13,000 afy.

Describe any projected increases to the severity or duration of drought in the project area resulting from changes to water supply availability. Provide support for your response.
The amount of Colorado River water estimated to be available to SNWA on an annual basis under normal water supply conditions is a consumptive use of 276,000 afy. Under existing agreements, SNWA is required to meet Nevada's combined drought and shortage obligation ranging from 8,000 afy to a maximum of 30,000 afy for Lake Mead elevations between 1,090 feet and 1,030 feet. In the event Lake Mead's elevation declines below 1,030 feet, the Secretary of the Interior will consult with Lower Basin stakeholders to determine if additional actions are needed. These potential drought and shortages impacts are important to LVVWD because it provides drinking water to nearly 70 percent of the SNWA service area population.

There is a high likelihood that SNWA and its member agencies will face drought and shortage obligations over the 50-year planning horizon from 2020 through 2070. In August 2019, the Colorado River System Simulation Model using historical hydrology projected a shortage probability of between four and 43 percent for the period 2021 to 2024 and between 47 and 82 percent during the remainder of the planning horizon. SNWA's water demands are projected to increase over the planning horizon. As a result, the frequency and magnitude of the SNWA's obligation are expected to increase over time (Appendix D Water Resource Plan). Drought conditions on the Colorado River are expected to exacerbate due to climate change, resulting in a greater likelihood of future shortage declarations.

E.1.4. Evaluation Criterion D—Project Implementation

Describe the implementation plan of the proposed project. Please include an estimated project schedule that shows the stages and duration of the proposed work, including major tasks, milestones, and dates.
The proposed project will equip five existing production wells with UV disinfection. UV disinfection will be used to provide additional disinfection credits of [redacted] In addition, disinfection [redacted] Each well site will be equipped with a new UV reactor, sand separator, surge tank, and required instrumentation and controls. This project will be completed as shown in Table 2. Engineering, design, and installation will be completed by employees and local contractors. It is anticipated that this project will take approximately 16 months to complete. Specific Standard

Operating Procedures for the operation and maintenance of the UV equipment will be developed for each well site.

Table 2. Project Schedule

Task	Start Date	Completion Date
Engineering/Design (Wells 1 and 2)	July 2021	October 2021
State Approvals (Wells 1 and 2)	September 2021	October 2021
Equipment Procurement (Wells 1 and 2)	October 2021	February 2022
Construction/Installation (Wells 1 and 2)	February 2022	April 2022
Start-up/Testing (Wells 1 and 2)	April 2022	April 2022
Engineering/Design (Wells 3, 4, and 5)	October 2021	January 2022
State Approvals (Wells 3, 4, and 5)	January 2022	February 2022
Equipment Procurement (Wells 3, 4, and 5)	February 2022	June 2022
Construction/Installation (Wells 3 and 4)	June 2022	August 2022
Start-up/Testing (Wells 3 and 4)	August 2022	August 2022
Construction/Installation (Well 5)	September 2022	October 2022
Start-up/Testing (Well 5)	October 2022	October 2022

Describe any permits that will be required, along with the process for obtaining such permits.

Water rights for each well are issued. Submission and approval of preliminary engineering report and application by NDEP - BSDW is required prior to the installation at the well sites. Approval for discharge of the treated groundwater to the distribution system (i.e., as potable water) is also required from NDEP - BSDW. NDEP – BSDW may require specific testing or additional materials as appropriate. When water is wasted and discharged to the storm drain, approval from National Pollutant Discharge Elimination System (NPDES) is required, and within their jurisdiction, approval from the City of Las Vegas is required. Information that must be disclosed includes physical address of the well, nearest major cross streets, estimated discharge dates, duration of discharge, expected flow rate, and total volume expected to be discharged. These discharges would be covered under LVVWD's Individual Maintenance Discharge Permit. All required local construction permits from Clark County and the City of Las Vegas will be obtained.

Identify and describe any engineering or design work performed specifically in support of the proposed project.
Preliminary engineering studies and design work for one well (W101) have been completed, in addition to submittals to NDEP - BSDW. Additional engineering and design will be required for each well site.

Describe any new policies or administrative actions required to implement the project.
No new policies or administrative actions are required.

E.1.5. Evaluation Criterion E—Nexus to Reclamation

How is the proposed project connected to a Reclamation project or activity?
The project is in the LVVWD service area in the Colorado River Basin and receives Colorado River water diverted by SNWA through intake facilities in Lake Mead.

Will the project benefit any tribe(s)?
The project will not directly benefit any tribe.

Does the applicant receive Reclamation project water?
SNWA (Contract Numbers 2-07-30-W0269 as amended and 7-07-30-W0004 as amended) and LVVWD (Contract Number 14-06-3000-2130 as amended) receive Colorado River water under Colorado River water delivery contracts with the Secretary of the Interior (See: https://www.usbr.gov/lc/region/g4000/contracts/entitlements/NVentitlements.pdf).

Is the project on Reclamation project lands or involving Reclamation facilities?
None of the project sites are located on Reclamation lands or involve Reclamation facilities.

Is the project in the same basin as a Reclamation project or activity?
The project is in the Las Vegas Valley Groundwater Basin, located in the Colorado River Basin.

Will the proposed work contribute water to a basin where a Reclamation project is located?
The project will contribute water to LVVWD, located in the Colorado River Basin.

E.1.6. Evaluation Criterion F—Department of the Interior and Bureau of Reclamation Priorities

Department of Interior Priorities
1a. *Creating a conservation stewardship legacy second only to Teddy Roosevelt by utilizing science to identify best practices to manage land and water resources and adapt to changes in the environment*.
As one of SNWA's member agencies, LVVWD works closely with SNWA to provide a safe and reliable water supply for Southern Nevada. LVVWD plays a significant role in supporting critical SNWA responsibilities that benefit water users, including maintaining a regional conservation program, acquiring new resources, managing existing resources, and maintaining water quality standards.

Bureau of Reclamation Priorities

1. *Increase Water Supplies, Storage, and Reliability under WIIN and other Authorities*
Bureau Colorado River Basin Study projects a 3.2-million-acre-foot median supply demand imbalance on the Colorado River. This project is a means to helping ensure existing resources remain viable and allows for recovery of banked water to help manage resources in Southern Nevada with indirect benefits by not placing greater pressure on the Colorado River.

3. *Leverage Science and Technology to Improve Water Supply Reliability to Communities*
Based on previous field-scale testing, the chlorine CT required to provide [redacted] exceeded the current capacity and footprint available at most well sites. After evaluating more advanced treatment alternatives, including UV, ozone, and chlorine dioxide, UV disinfection was selected as the preferred treatment control strategy. Extensive field-scale testing will be conducted, significantly contributing to a broad knowledgebase of how best to approach [redacted]

4. *Address Ongoing Drought*
As severe and sustained drought conditions in the Colorado River Basin continue to threaten water supplies, increasing well capacity increases safe and reliable water supplies.

6. Project Budget: Funding Plan

LVVWD's key funding sources include tiered consumption charges and a variety of service charges. These revenue sources provide a mix of funding, helping to ensure the financial stability and capacity of the organization. Matching contributions for this project will be provided by LVVWD. No funding will be provided by a source other than the applicant.

Table 3. Total Project Cost

SOURCE	AMOUNT
Costs to be reimbursed with the requested Federal funding	$848,372.00
Costs to be paid by the applicant	$848,372.00
Value of third-party contributions	$0.00
TOTAL PROJECT COST	$1,696,744.00

7. Project Budget: Budget Proposal

Table 4. Budget Proposal

BUDGET ITEM DESCRIPTION	COMPUTATION		Quantity Type	TOTAL COST
	$/UNIT	QUANTITY		
Salaries & Wages				
Process Systems Engineer	51	300	Hour	$15,300.00
Chemical Engineer	56	500	Hour	$28,000.00
Electrical Engineer P.E.	53	500	Hour	$26,500.00
Mechanical Engineer P.E.	53	200	Hour	$10,600.00
Process Control System Engineer	53	400	Hour	$21,200.00
Senior Geospatial Tech	34	50	Hour	$1,700.00
Engineering Tech I	31	400	Hour	$12,400.00

Systems Ops Superintendent	59	65	Hour	$3,835.00
Mechanical Supervisor Maintenance	46	65	Hour	$2,990.00
Electrical Supervisor Maintenance	46	65	Hour	$2,990.00
Electrical –Electronics Systems Tech II (3 individuals)	35	1200	Hour	$42,000.00
Heavy Equipment Operator (3 individuals)	29	600	Hour	$17,400.00
Senior Planner Scheduler	37	65	Hour	$2,405.00
WQ Monitoring Field Specialist	26	240	Hour	$6,240.00
Laboratory Scientist II	46	100	Hour	$4,600.00
Assistant Management Analyst	38	40	Hour	$1,520.00
Fringe Benefits				
N/A				
Travel				
Round trip mileage to wells	0.575	10000	Miles	$5,750.00
Equipment				
UV Equipment	$75,000.00	5	Well	$375,000.00
Surge Tank	$50,000.00	5	Well	$250,000.00
Desander	$50,000.00	5	Well	$250,000.00
Valves	$20,000.00	5	Well	$100,000.00
Canopy	$10,000.00	5	Well	$50,000.00
Supplies and Materials				
Electrical Supplies	$5,000.00	5	Well	$25,000.00
Concrete	$10,000.00	5	Well	$50,000.00
Misc. Piping	$5,000.00	5	Well	$25,000.00
Microbiological Materials	$2,000.00	5	Well	$10,000.00
Contractual Labor				
Mechanical	$27,000.00	5	Well	$135,000.00
Other				
15% Contingency				$221,314.00
TOTAL DIRECT COSTS				
Indirect Costs				$0.00
Type of Rate	N/A			
TOTAL ESTIMATED PROJECT COSTS				$1,696,744.00

8. Project Budget: Budget Narrative

All costs included in this proposal are directly related to the project and necessary for its implementation. The non-federal contribution is 50 percent; the federal contribution is 50 percent.

Salaries and Wages
The Process Systems Engineer R & D will coordinate and design sampling campaigns; advise on design, systems operations, and planning; analyze and interpret [redacted] water quality results; assist in preparation of reports and communications on treatment design and treatment efficacy with NDEP - BSDW. The Chemical Engineer will coordinate overall design and installation of UV system, desander, and surge tank. The Electrical Engineer P.E. will complete electrical design and coordinate installation of electrical components. The Mechanical Engineer P.E. will assist in design and installation of equipment, as well as assist with approvals from NDEP - BSDW. The Process Control Systems Engineer will provide design of instrumentation and control systems for all equipment. The Senior Geospatial Technician and Engineering Technician I will complete necessary drawings. The Systems Operations Superintendent will provide support for start-up and operation of new equipment. The Mechanical Supervisor, Maintenance and Electrical Supervisor, Maintenance will provide supervision over their crews. Three Electrical/Electronic Systems Technicians II will install all electrical components. Three Heavy Equipment Operators will provide earthwork for underground electrical installation. The Senior Planner Scheduler will provide scheduling and procurement of materials and supplies. The Water Quality Monitoring Field Specialists will [redacted] water quality samples at sites and perform field analyses that will be used for demonstration of treatment efficacy to NDEP. The Laboratory Scientist II will complete analyses [redacted]. The Assistant Management Analyst will assist with grant administration and reporting requirements.

Fringe Benefits
Not applicable. The proposal does not include any fringe benefit costs.

Travel
Travel costs included are round trip mileage to the well sites.

Equipment
To complete the project, the following equipment purchases are required. UV equipment is needed to provide [redacted] and was priced through a vendor estimate, included in Appendix C. Surge tank equipment is needed to provide the UV reactor with protection from surge events and was priced through budgetary quotes. Valves are needed to provide isolation of the UV system for maintenance activities and were priced by engineering estimates and experience. Canopy is needed to provide shade for sensitive electronic equipment and was priced by engineering estimates and experience.

Materials and Supplies
Electrical supplies are needed for installation of the UV reactor, surge tank, desander, and ancillary instrumentation. Concrete is needed to provide footings for new equipment. Piping is needed to interconnect the UV reactor, surge tank, and desander to existing piping at well sites. Microbiological materials such as sample bottles, reagents, media, and trays [redacted] on water samples. All costs were based on engineering estimates and experience.

Contractual
LVVWD may contract mechanical work, dependent on the mechanical crew's workload. Since this contract would exceed the Simplified Acquisition Threshold, a competitive procurement method aligning with LVVWD policy and NRS requirements would be used to select the contractor. The mechanical crew will physically install the new process equipment (desander, UV reactor, and surge tank), including fabricating and installing new piping to and from each piece of equipment. Mechanical work includes three workers per well site for three weeks (360 hours per well) at a rate of $75 per hour. These costs are estimated based on engineering estimates and experience.

Third-Party In-Kind Contributions
Not applicable. The proposal does not include any third-party in-kind contributions.

Environmental and Regulatory Compliance Costs
Additional costs are not anticipated. If LVVWD receives an award, possible costs will be discussed during the development of the financial agreement.

Other Expenses
A total project contingency rate of 15% is included in the project budget to cover potential costs not specifically accounted for in the budget.

Total Direct Costs
Reclamation is requested to contribute $848,372 toward direct costs. LVVWD will provide a cash match of $848,372.

Indirect Costs
Not applicable. All direct costs align with eligible categories. LVVWD does not have a federally negotiated indirect cost rate agreement. No funds are requested for indirect costs.

9. Environmental and Cultural Resources Compliance

Will the proposed project impact the surrounding environment? Please briefly describe all earth-disturbing work and any work that will affect the air, water, or animal habitat in the project area. Please also explain the impacts of such work on the surrounding environment and any steps that could be taken to minimize the impacts.
The project will be conducted entirely within the boundaries of existing permitted well sites. All the sites are enclosed by fencing, either block wall or chain-link. The new equipment, including UV reactor, sand separator, surge tanks, instrumentation, and controls will all be installed within previously disturbed areas, which are no longer animal habitat. Minimal earth-disturbing work may be required at some sites, if the existing discharge piping is not long enough to install the UV reactor, however those sites would be less preferred under the site selection criteria. Impacts of this earthmoving are not anticipated, as the work would be conducted in accordance with requirements of dust control and stormwater pollution prevention permits.

Are you aware of any species listed or proposed to be listed as a Federal threatened or endangered species, or designated critical habitat in the project area? If so, would they be affected by any activities associated with the proposed project?
The Las Vegas Valley contains habitat for the endangered desert tortoise (*Gopherus agassizii*), but is not designated critical habitat. Endangered Species Act coverage is provided for private

lands in Clark County under the Clark County Multiple Species Habitat Conservation Plan, and for federal lands managed by the Bureau of Land Management (including five of the potential project sites) under the Programmatic Biological Opinion for the Southern Nevada District. Most of the potential sites are within urbanized areas of Las Vegas, however, there is potential desert tortoise habitat surrounding or in the vicinity of, a few sites. Because desert tortoise exclusion is provided by the existing block walls around those sites, and the areas within the sites are no longer habitat, effects to desert tortoise from the proposed project are not anticipated.

Are there wetlands or other surface waters inside the project boundaries that potentially fall under CWA jurisdiction as "Waters of the United States?" If so, please describe and estimate any impacts the proposed project may have.
There are no wetlands or surface waters within the boundaries of the proposed project sites.

When was the water delivery system constructed?
The production wells were constructed between 1963 and 1996, with most having been drilled between the late 1980s and mid 1990s.

Will the proposed project result in any modification of or effects to, individual features of an irrigation system? If so, state when those features were constructed and describe the nature and timing of any extensive alterations or modifications to those features completed previously.
The project would not require modification to, or effects upon, an irrigation system. These wells are part of water supply to an urban water distribution system.

Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the National Register of Historic Places? A cultural resources specialist at your local Reclamation office or the State Historic Preservation Office can assist in answering this question.
As noted above, the wells were constructed between 1963 and 1996, with most drilled between the late 1980s and mid 1990s. They have been in continuous use with regular maintenance since their original drilling and construction until recently. None of these sites have been evaluated or are known to be eligible for listing on the NRHP. These wells and well sites are standard construction, with none associated with significant events, specific important individuals, distinctive type or part of a historic district, or having the potential to yield information important in prehistory or history.

Are there any known archeological sites in the proposed project area?
The proposed project would be conducted entirely within the boundaries of the existing well sites, which were previously disturbed by construction of the wells. No recorded cultural sites were identified in a review of the Nevada Cultural Resource Inventory Survey (date of search 7/27/20).

Will the proposed project have a disproportionately high and adverse effect on low income or minority populations?
Some of the potential well sites are in areas that may have low income or minority populations. However, the proposed project would not have any adverse effect on those populations, as all the work would be done within the boundaries of the existing well sites.

Will the proposed project limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands?

The proposed project would not limit access to or ceremonial use of Indian sacred sites or impact tribal lands. None of the potential well sites are located on tribal lands or known sacred sites.

Will the proposed project contribute to the introduction, continued existence, or spread of noxious weeds or non-native invasive species known to occur in the area?
Movement of vehicles and equipment between sites has a potential to spread weeds. However, LVVWD requires heavy equipment be steam cleaned prior to arrival on the job site to prevent the introduction or spread of noxious or invasive weeds. Thus, the potential for the proposed project to introduce or spread noxious or invasive species is low.

10. Required Permits or Approvals

Approvals described in Evaluation Criterion D will be obtained.

11. Letters of Support

Not applicable.

12. Official Resolution

An official resolution authorizing the submission of this proposal and confirming the subject matching requirements will go before the LVVWD Board of Directors at its August 4, 2020 meeting. A copy will be forwarded to Reclamation at that time, which is within the 30-day deadline.

13. Unique Entity Identifier

The LVVWD maintains an active registration in SAM.gov. Its Cage Code is 1MY13. The LVVWD's unique entity identifier, or DUNS No., is 041670829.

14. Supporting Documents: Appendices A - E

All appendices are included as attachments via grants.gov.