Development of a Smart Water Grid on Tribal Lands

A proposal submitted to the U.S. Bureau of Reclamation
WaterSMART Drought Response Program

(FOA No. BOR-DO-17-F010)

Blue Lake Rancheria Tribe
428 Chartin Road, Box 428
Blue Lake, California 95525

Project Manager: David Narum, Ph.D.
dnarum@bluelakerancheria-nsn.gov
707-668-5101, x 1047

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I. Executive Summary

Date: February 14, 2017

Applicant Name/City/County/State: Blue Lake Rancheria Tribe, Blue Lake, Humboldt, California

One paragraph summary: This proposal to the Bureau of Reclamation (Reclamation) from the Blue Lake Rancheria (BLR) tribe is to develop a "smart water grid" (SWG) at BLR. The SWG will provide BLR with a reliable potable water source, and help the tribe improve its water management while addressing drought and other resilience-related needs. Tribal sovereignty issues, including access to affordable, clean water, and resilience and sustainability all hinge on BLR's access to resources and capacity to utilize those resources wisely. Currently, BLR uses municipal water from the neighboring community of Blue Lake, California. Various wells on the BLR reservation provide water for irrigation and non-potable uses. Reliance on the municipal water supply is costly (owing to significant leaks in the water supply) and reduces self-sufficiency and resilience. It is our hope that with these funds we can complete another piece of our resilience puzzle. Reclamation funding will help BLR: 1) become water self-sufficient, 2) build our resilience capacity to drought and other hazards, 3) utilize tribal resources more effectively, and 4) provide a redundant regional system in the event of an emergency. We estimate the full implementation of the project, from scoping to contractor selection, to implementation and commissioning, will take less than two years, with completion scheduled for fall 2019. The project is on tribal trust land—not on a federal facility.

II. Background Data

Map of the Area

Figure 1. Left, location of Blue Lake Rancheria in Humboldt County. Right: Location of key facilities and water grid infrastructure at the Blue Lake Rancheria.

Geographic location: Blue Lake, California, Humboldt County.
Sources of water supply: 1) potable: Humboldt Bay Municipal Water District, 2) non-potable: Well 1, 300 gpm; Well 2, 75 gpm.
Total quantity of water supply managed and supplied: Approximately 30,000 gallons/day.
Water rights involved: riparian.
Current water uses: 1) potable water for residential/commercial, 2) non-potable water for small-scale sustainable agriculture and landscaping irrigation.
The number of water users served: ~2,000/day (residents and visitors); 3,000+ potential in emergency situations.
Current and projected water demand: 15,000 gallons/day, slight growth over time but a potential in emergency for higher demand and/or need for use restrictions. Demand is half of supply: there is likely a substantial leak in the existing supply system, possibly up to half of our water purchases.
Potential shortfalls in water supply under drought conditions: restrictions on municipal supplies; groundwater impacts.
Applicant's water delivery or distribution system description: standard water distribution system for residential/commercial facilities tied into municipal water; irrigation system tied into well.
Number of irrigation turnouts: 8 different zones.
Total approximate length of distribution lines: main lines, approximately 2,000 feet; distribution lines have not been estimated.
Number of storage tanks: BLR has no storage tanks.
Number of pump stations and capacities: 2 main wells, 1) Well 1, 300 gpm, 2) Well 2, 75 gpm; see Figure 1 above).
Number of connections and/or number of water users served: 200+ connections; 2,000 to 3,000 potential water users per day depending on conditions (business-as-usual or emergency; estimates include casino patrons).

The Reclamation-Funded ARRA Well

In 2011, Reclamation funded the development of Well 1 (see Figure 1 for location), which is the source of water for the SWG; the SWG expands on prior Reclamation work. Features of Well 1 (the "ARRA well") include:

- A 62' deep well to access minimum 300 gpm of water (depth to static water level is 18').
- Remote well electrical building to house the well electrical panel, transformer and pressure tank (10' x 12' well building).
- Approximately 750' of joint utility trench with high and low voltage electrical lines and water piping.
- A main building to house the 3-phase electrical service drop and the water chlorination system (28' x 28').
- Approximately 750' of main water line (C900 pipeline) to connect to the Tribal Government Building (TGB).
- Re-valving work at the TGB to allow new well water into existing delivery system.

III. Project Description

Goals of the SWG Project

Several goals guide the SWG project:

- Goal 1 – Increase Water Management Flexibility and Self-Sufficiency at BLR: By developing tribal-owned, decentralized SWG infrastructure, BLR will increase operational autonomy (which may be critical during emergencies) and self-sufficiency in water management (use of available water supplies and infrastructure).
- Goal 2 – Enhance Adaptation Planning: BLR's SWG will develop staff capabilities, tools, and guidance to incorporate climate information and address climate impacts in the delivery of water, power, other critical infrastructures, and surrounding ecosystems and habitat.
- Goal 3 – Expand Information Sharing: BLR will collaborate with regional stakeholders to support adaptation efforts through sharing data and tools. Stakeholder access to water management data and information sharing through outreach activities will help make adaptation efforts and environmental information more commonly understood.

The above goals work together for resilience impacts. Water management flexibility includes innovative water conservation methods and use of advanced water treatment technology, both of which will be incorporated in the SWG. In addition, the SWG will make important data and tools more timely, accessible, and useful as planning decision-support tools. For example, a web-based SWG portal will enhance knowledge networks, make information access easy, cheap and fast, and build awareness on cutting-edge information, tools, and resilience and adaptation approaches in regard to shepherding sustainable water use.

Specific Activities and Project Scope for BLR Funds

The primary activities funded by this grant include: 1) integration of smart systems into an existing plan for a tribal water system to create an SWG, 2) selection of qualified contractors, and 3) implementation of the SWG, including integration of the SWG with other critical infrastructures at BLR. BLR is requesting $300,000 from Reclamation for the SWG drought resilience project. All other associated staff, infrastructure and land costs are provided as an in-kind match. Cost estimates have been derived from adding smart grid component cost estimates to contractor-provided estimates for a "nonsmart" water grid: a variable frequency pressure system (with treatment) using our existing, Reclamation-funded, 300-gpm ARRA Well. The estimated cost of the project without smart components is approximately $230,000 (items #1-14 below). The estimate for the addition of smart grid features (including BLR staff training) for this first phase of the SWG is $70,000.

The SWG system includes (but is not limited to) the following components:

1) flow restrictor at wellhead to reduce 300 gpm flow to 40 gpm for the water treatment system,
2) 4" brass flow meter with totalizer at wellhead,
3) a chemical injection pump in pressure line from well pump at well head,
4) water treatment units to address water quality issues,

5) a 30’ x 30’ tank pad filled with 3/8” pea gravel,
6) four (4) 5,000-gallon water storage tanks,
7) variable frequency pressure system (vertical multistage booster pumps) to supply water to hotel and casino,
8) 4” brass flow meter with totalizer on service line to casino,
9) greensand filters,
10) carbon filters,
11) backflow prevention valves,
12) water softener units,
13) necessary bypass and access manifolds,
14) smart grid devices (see below), and
15) other items as needed.

Smart Grid Devices (#15, above)

Appropriate smart grid devices will be developed with the contractor(s) and will be selected to optimize operational flexibility given funding constraints (i.e., we anticipate to integrate further smart systems after this initial phase). SWG devices can be categorized into the six main areas listed below[1]:

- Data acquisition and integration (e.g. sensor networks, smart pipes/meters).
- Data dissemination (e.g. radio transmitters, WiFi, Internet).
- Modelling and analytics (e.g. geographic information system (GIS), Mike Urban, Aquacycle, assessing and improving sustainability of urban water resources and systems (AISUWRS), and urban groundwater (UGROW).
- Data processing and storage (e.g. software as a service (SaaS), cloud computing).
- Management & control (supervisory control and data acquisition (SCADA), optimization tools).
- Visualization and decision support (web-based communication and information systems tools).
- Restitution of data to technical services and to the end users (e.g., tools for sharing information on water and services).

Why Implement a Smart Water Grid?

Figure 2[2] provides a representative diagram of a SWG with various smart components. BLR’s SWG will begin at the water source, where smart meters, smart valves, smart pumps, and flood sensors will be installed. Water continues through the water treatment system with more smart meters, valves, and pumps. Water contaminant sensors will be deployed at various locations throughout the system.

[1]International Telecommunication Union (2015), "Smart water management in cities." Supplement 16 to ITU-T L-series Recommendations.
[2]Mutchek, Michele, and Eric Williams. "Moving Towards Sustainable and Resilient Smart Water Grids." Challenges 5.1 (2014): 123-37

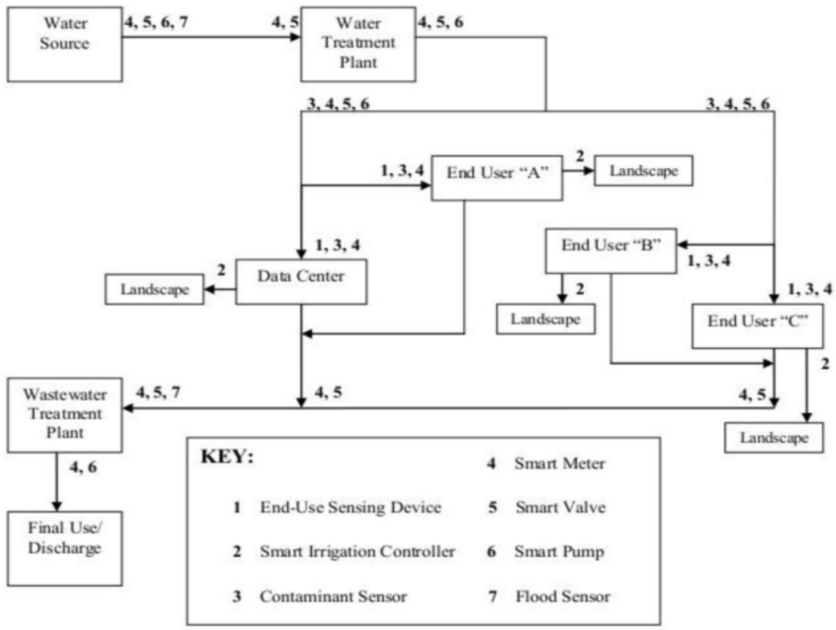


Figure 2. Representative diagram of a smart water grid (op. cit. Mutchek and Williams, 2014).

At the end-use locations, end-use sensing devices, such as smart irrigation controllers, contaminant sensors, and smart meters, will be deployed.

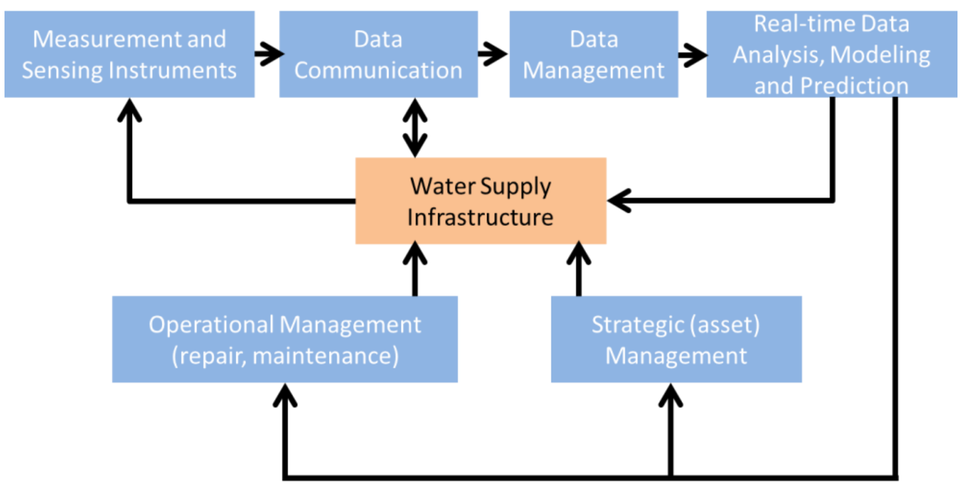


Figure 3. Smart Water Grid Supply Network Conceptualization

Figure 3 provides an SWG supply network conceptualization, showing data flow charts and control feedback loops. Sensing devices that collect and transmit data about the water system on a real-time basis are the foundation of any SWG. The most common method currently used to monitor water delivery systems is manually reading flow and pressure meters, with water contamination monitored by collecting water samples for laboratory analysis. In an SWG system, these parameters would be collected, stored, and transmitted to a computer by the meter itself, or from a sensor to detect contamination, which increases the amount and frequency of information about the system and decreases the need for field work (op. cit. Munchen and Williams, 2014).

Smart valves and pumps adjust their operations based on environmental conditions or signals from sensors. These adjustments can happen automatically or remotely by a human controller. The main benefit of smart controllers is increased efficiency. For example, variable speed pumps sense water conditions and will ramp up or down depending on those conditions. Smart valves adjust or block the flow of water in pipes based on environmental conditions. They can be used as part of pressure management strategies, as part of leak detection activities, or to prevent contamination (Ibid.).

At the end-use level, smart irrigation controllers can help save water that is wasted on landscape irrigation. Smart irrigation controllers receive and collect weather data, as well as sense soil moisture levels and other parameters, which helps determine proper water scheduling. Using these data, the watering schedule can be automatically updated on a daily basis. The valves and pumps that implement the actual watering of the landscape will cycle on and off at the best times possible (Ibid.).

Interdependent Lifeline Sectors

There are four interdependent "lifeline sectors" (LLS): energy, water, transportation, and communications. This proposal to Reclamation for assistance will help BLR address resilience needs in the water sector, but will also (because of the interdependencies) be helping BLR address the resilience of all LLSs. Just as in most rural and urban water systems, BLR's water system faces resilience challenges from drought, natural disasters, water leaks, over-use, and potential water quality issues. It is our belief that we can benefit from advances in information and communications technologies (ICTs) to address these challenges. One clear benefit is the opportunity to train community members and other stakeholders, and to develop jobs fostering resilience, through smart technologies that help us better respond to ongoing threats.

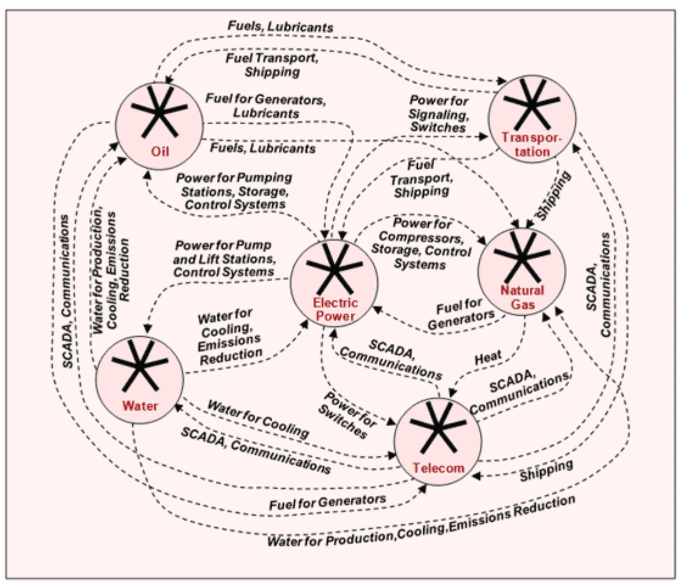
Threat Amplification and Cascading Impacts. In a disaster, the region's rural isolation makes it prone to "threat amplification," i.e., the cascading impacts of infrastructure failure (e.g., power loss leading to communications loss or to loss of water pumping power) that make a coordinated regional response even more difficult. BLR is a certified Red Cross shelter-in-place site (located 5 miles from the Pacific Ocean, outside the tsunami zone), and our infrastructure projects seek to enable "life, health, and safety-level" power and water for as long as needed in an emergency. A reliable and resilient source of water is thus important both for BLR and for the broader regional population that evacuates to BLR's Red Cross Shelter and counts on us for lifeline infrastructure and services.

Like many municipal water systems, BLR's current water supply is transported over creaky infrastructure, specifically through a pipe that runs over the Mad River on a very old (and condemned) railroad trestle. If this pipeline fails, water service could be shut off for months. The current (no pun intended) Oroville Dam situation in Northern California provides a harrowing example of the potential for infrastructure failure, and also offers evidence that it is not just droughts, but the opposite problem, that can wreak havoc. In effect, planning needs to recognize that the cycles of nature do not just point in one direction!

To address interdependencies, BLR's SWG distribution and management system will be networked with other critical infrastructure systems at the Rancheria to ascertain how they are performing and interacting with each other (instead of thinking about infrastructures in silos). For example, water systems are critical components of energy management, as energy is typically the largest controllable cost in water operations; even so, optimizing filtration/treatment plants and distribution networks is an often overlooked solution. In addition, water loss management is becoming increasingly important as supplies can be stressed by overuse and/or water scarcity. BLR's SWG will allow our water managers to minimize "non-revenue water" (NRW) losses by finding leaks using real-time SCADA data and comparing the data to modeled network simulations. Reducing NRW will allow BLR to recover significant costs incurred in treatment and pumping.

It is also important to assess the real and potential impacts of droughts on other critical infrastructures. Because of infrastructure interdependencies, it is important to assess not just how an event impacts one critical infrastructure component, such as the water system, but how impacts in each system "cascade" into other systems. For example, droughts are often accompanied by higher than average temperatures, which create more demand for power for cooling. Excessive demands on power systems can reduce the availability of power for pumps and lift stations—and so on. As shown in Figure 4[3], there are virtually an unlimited number of potential infrastructure interdependencies. The use of smart technologies for system monitoring and management is becoming essential in order to manage the increasingly complex, networked, data- and information-rich nature structure of critical infrastructures today.

Figure 4. Infrastructure interdependencies among water, electric power, transportation, communication, and other energy sources.



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[3] J. Peerenboom, R. Fisher, and R. Whitfield (2001). "Recovering from Disruptions of Interdependent Critical Infrastructures" Presentation to the workshop on Mitigating the Vulnerability of Critical Infrastructure to Catastrophic Failures, September 10-11, 2001. World Institute on Disaster Risk Management, Alexandria, VA.

<u>BLR Drought Response Plan.</u> As with other components of BLR's Tribal Multi-hazard Mitigation Plan (TMHMP, 2015), the Drought Response Plan (DRP; in proposal attachments) provides basic guidance on mitigating vulnerabilities, identifying the need for capital improvement projects, equipment, and training activities that can help BLR achieve its resilience goals. This proposal to Reclamation springs directly from the DRP as outlined in the TMHMP (p. 119):

> BLR will monitor current water system capabilities and identify and recommend capital improvements to improve the water system's ability to get through times of drought. The water system must continue to provide for system operation flexibility while providing improved pumping and storage capacity and new technologies to meet the demands of tomorrow.

As with other plans in the TMHMP, the DRP was developed through a collaborative effort that included public education and discussion. BLR focused its drought planning on monitoring, vulnerability assessment, and risk management. Other water-related resilience efforts at BLR include (among others): 1) water and energy efficiency efforts, 2) on- and off-grid solar power for water grid infrastructure components, 3) small-scale sustainable agriculture, and 4) drought-resistant landscaping. Because of the episodic, variable and uncertain nature of droughts, BLR views drought management as a long-term and ongoing concern. And as with other risk management efforts, we understand the importance of a "network of collaboration" in the region. To that end, we both inform and are informed by other agencies about drought-related activities, and involve partners in our efforts as appropriate.

BLR's drought planning is an important component of the TMHMP, and is a response to the potential threats posed by drought, including: water shortages and water quality impacts, increased wildfires and fire threats, air quality impacts, road closures, invasive species, fish and wildlife death and disease, loss of wetlands and riparian habitat, wind erosion and visibility issues, and other social, economic and environmental impacts. Additional resiliency challenges faced by water managers at BLR include natural disasters, vandalism, terrorism, and water system issues such as leaks, over-use, high energy consumption, and long-term supply concerns. SWGs are a strategy that will enhance BLR's sustainability and resiliency; by incorporating networked monitoring and control devices, an SWG provides diverse, real-time information about the water system and gives water managers significantly enhanced control (discussed in greater detail below).

<u>Collaboration with Partners</u>. Tribal communities such as BLR often collaborate with state and federal partners on infrastructure needs, such as BLR's extensive partnershipping with myriad state and federal entities in its energy microgrid development. In addition, BLR works closely with nearby Humboldt State University (HSU), in particular providing opportunities for HSU's Environmental Resources Engineering students to participate in projects at the Rancheria.

BLR has utilized information and tools from the EPA's Creating Resilient Water Utilities (CRWU) initiative to better understand the vulnerability of our water systems to current and potential climate-related impacts, including drought; the assessment exercises use the EPA's Climate Resilience Evaluation and Awareness Tool (CREAT), which bring people together to prioritize vulnerable water resources and assets, assess risks, and evaluate potential adaptation options. BLR is reviewing the California drought planning handbook[4] for tribes, and will be incorporating guidance from the handbook in our planning going forward.

EPA Region 9 and the Indian Health Service (IHS) are coordinating information on infrastructure needs and funding, technical assistance, emergency drought relief, and conservation opportunities for tribes. BLR's Facilities Department and Office of Emergency Services (OES) have worked and will continue to work with many different Federal and state partners, including Reclamation (BOR), Department of Homeland Security (DHS), the USDA Rural Development, HUD, U.S. Army Corps of Engineers (USACE), Bureau of Indian Affairs (BIA), California Office of Emergency Services (CalOES), California Department of Water Resources (CDWR), and the California State Water Resources Control Board (SWRCB).

BLR has played a lead role in energy planning and implementation among national tribes, and we are keen to show how smart water systems can be integrated into a state-of-the-art critical infrastructure program for rural tribes and communities. The BLR SWG will allow for an increase in knowledge and data that we will share with others. An awareness of available data, monitoring activities and decision support tools for water management—from drought to high precipitation events—and effective communications methods and resources, are all critical parts of capacity building at BLR, and across the region and nation.

BLR, Resilience, and the Threats in our Region

In 2015-16, BLR's resilience efforts led to us being awarded a U.S. White House "Climate Action Champion Award," one of only 16 given across the nation. Much of BLR's action on resilience to date has taken place in the energy sector, including the development of a low-carbon microgrid powered by a 500-kW solar photovoltaic array and 1-MWh Tesla battery storage system. The "smart" energy microgrid is controlled by a microgrid management system (Siemens MGMS), and BLR has also integrated energy management controls for its HVAC system into the microgrid.

BLR's SWG development fits into its tribal vision for its water needs: to provide affordable and environmentally safe water for BLR members, residents, government, and economic enterprises for the purpose of tribal sovereignty, economic self-sufficiency and environmental protection (landscape, fish and wildlife). The SWG project is part of a broad and aggressive resilience action strategy at BLR. Since 2008, BLR has implemented a wide range of projects to improve tribal and regional resilience and security, including: 1) maximizing resource use efficiencies, 2) implementing resource resilience measures, 3) working aggressively to transition from fossil to renewable energy sources, and 4) taking actions to ensure continual critical infrastructure operations in business-as-usual and short- and long-term emergency situations.

The Resilience Training Center at BLR

Because of its focus on resilience, BLR has launched an initiative to develop a Resilience Training Center (RTC) with a large grant from DHS. The primary purposes of the RTC campus and its

[4] State of California (2015). "Drought Planning Handbook Emergency Drinking Water Supply for California Indian Tribes."

programming are to provide programs in: 1) emergency, economic, environmental, and social resilience capacity, 2) emergency preparedness, continuity of operations, energy and water industry skill sets/technology/operations, 3) science, technology, engineering, arts and math (STEAM) education, 4) resilience-related communications, and 5) skill-building, career-readiness, public outreach, and environmental literacy and engagement. Goals of the RTC include:

- protecting and maintaining BLR's and the region's critical infrastructure on the rural, remote North Coast of California,
- long-term programmatic deployment of trainings and other resources in this region for both tribal governments and other stakeholders,
- conducting outreach with local agencies, state and federal entities to help ensure that all training requirements are facilitated, and joint security and emergency preparedness activities continue region-wide, and
- working with economic development partners to create an entrepreneurship ecosystem focused on resilience-related products and services.

For BLR, it is important to consider the value of the SWG not just for its value for drought resilience and water management, but also as it fits into BLR's broader resilience training vision. We envision our reservation as a nationally recognized Resilience Campus that will provide both in-class and field-based training in resilience practices and technologies. Like the low-carbon microgrid, the SWG would provide a real-world example for RTC participants of the potential for achieving resilience, even in remote rural areas, with the thoughtful deployment of smart technologies and systems. Indeed, with its existing low-carbon energy microgrid and planned SWG, BLR is playing an important role as a leader among small rural tribes and communities in:

- setting a vision and roadmap for an efficient, livable, resilient and sustainable rural region,
- combining state-of-the-art hardware and software to improve operating systems,
- integrating infrastructure systems for operational and informational efficiency,
- innovation/entrepreneurship as a foundational element of planning and operations,
- collaboration across the smart region value chain, and
- leadership and governance around resilience.

These projects are designed to be replicable in different communities. BLR has always been willing to share its experiences and successes so that others can achieve positive results.

IV. Evaluation Criteria

Environmental and Cultural Resources Compliance:

1) *Will the proposed project impact the surrounding environment?* The SWG project will have minimal environmental impact other than soil disruption (e.g., trenching) in areas that have existing infrastructure and have been subject to tribal environmental review.

2) *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?* No.
3) *Are there wetlands or other surface waters inside the project boundaries that potentially fall under Clean Water Act (CWA) jurisdiction as "Waters of the United States?"* No.
4) *When was the water delivery system constructed?* The existing infrastructure was put in place in stages: 1) hotel/casino/event center in 2008-09, 2) area for planned development in 2012, and 3) the infrastructure proposed here (2017).
5) *Will the proposed project result in any modification of or effects to, individual features of an irrigation system?* No.
6) *Are any buildings, structures, or features in the irrigation district listed or eligible for listing on the National Register of Historic Places?* No.
7) *Will the proposed project have a disproportionately high and adverse effect on low income or minority populations?* No.
8) *Will the proposed project limit access to and ceremonial use of Indian sacred sites or result in other impacts on tribal lands?* No.
9) *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?* No.

Evaluation Criterion A—Project Benefits (40 points)

BLR's SWG project makes additional water supplies available, improves water management, and will improve drought resiliency through improved well utilization, water storage, and more effective water delivery and use. The SWG project, when implemented, will be able to supply all of the total water supply for BLR; the existing municipal water system will serve as a secondary, backup source. As noted earlier, there are significant benefits to BLR from developing its own water supply, from economic and environmental to social and cultural, and for everyday planning.

How will the project build long-term resilience to drought?

The main way that smart water grid improves resiliency is by providing an increasing amount of information about the whole system (technological, infrastructural, and natural), allowing for more timely feedback and improved adaptive management practices. Currently in most water systems there is relatively little information before water reaches the treatment plant and after it leaves. This means that there are many small problems in the system that go undetected and then can compound and become catastrophic failures. For example, BLR is highly confident that leaks exist in the water mains. Unfortunately, when these leaks go undetected, they continue to worsen, even leading to main breaks that can disrupt the system for an extended period of time. When all these small stressors are added together, the potential for many failures happening at once, or the susceptibility to widespread failure from an acute threat, increases. This is particularly worrisome during drought conditions.

As noted above, drought is currently a resilience challenge in many areas, and climate change may increase the magnitude, frequency, and locations of impact around BLR. A typical strategy that tribes and municipalities employ to deal with short-term drought is to impose watering restrictions, but restrictions can be hard to enforce and may not be an adequate strategy for extreme or longer-term drought conditions. Long-term drought planning can be a complex and data- and modeling-intensive, and there are significant benefits from the use of data and instruments such as in an SWG to predict and mitigate the impacts of a drought.

How many years will the project continue to provide benefits?
The SWG will provide benefits for as long as the system is properly maintained/managed (decades).

How will the project improve the management of water supplies?
The SWG project increases efficiency and operational flexibility for BLR's water management operations. The development of state-of-the art water grid infrastructure will significantly increase the real-time awareness of water managers of how effectively water is being delivered and how it is being used. A system cannot be managed properly without adequate information about that system, so a major value of an SWG is the data gathered. With more system information, water managers can make better decisions. By installing smart meters at various locations in the system and installing end-use tracking devices at the end-use locations, managers can learn more about how water is being used and where potential problems, such as leaks, are located. Better monitoring of the distribution system for pressure and water quality also helps managers make better decisions. Managers have more ability to prioritize repairs and maintenance of system and more ability to reduce waste at the end-use level (op. cit., Mutchek and Williams, 2014).

Water quality is another issue that SWGs can address. Biosensors can identify growth of biofilms, the removal of which improves water quality and reduces pumping energy in the water distribution system. Multi-contaminant sensors can indicate potential areas of contaminant intrusion that would normally go undetected. At the end-use-level, smart irrigation controllers and end-use sensing devices give consumers more control over their water use. End-use-sensing devices can help in leak detection and help users understand their water use behavior better. In addition, SWGs can help prevent pipe deterioration and help detect problems when they occur. Smart pressure management, for example, can help detect pipe damaging high pressure spots inside the distribution system, by using smart pressure meters to detect areas of high pressure and then use smart pumps and valves to reduce pressures in these areas. When pipe breakdown does occur, smart step testing can detect small leaks before they become big problems (Ibid.).

Will the project have benefits to fish, wildlife, or the environment?
BLR manages its landscape with native, drought resistant plants and follows the principles of regenerative design, with attention given to impacts on fish, wildlife and the environment. The SWG will play an important role in the ability of BLR to manage its landscape even more effectively.

What is the estimated quantity of water that will be better managed as a result of this project?
The estimate of daily usage at BLR is 15,000 gpd, an estimate that is calculated from BLR's effluent volumes. The SWG system will supply all of this demand. As noted earlier, in addition to the economic benefits of the system (largely through reduced waste and much higher operational efficiencies), the tribe sees substantial benefits in the system from the perspective of tribal sovereignty and self-sufficiency.

If the proposed project includes any of the following components, please provide the applicable additional information: Wells. The two main existing wells at BLR are Well 1, 300 gpm capacity, and Well 2, 75 gpm capacity. The SWG project will integrate with Well 1, which will be used as a primary supply but will be stepped down to 40 gpm prior to the treatment phase. Well 1 was completed with Reclamation ARRA funds and has been reviewed for potential adverse impacts to the aquifer.

Please describe the groundwater monitoring plan that will be undertaken and the associated monitoring triggers for mitigation actions.
A Quanti-Tray test performed on Well 1 on June 18, 2015, indicated presence of Coliforms and small amount of E. coli. This fact indicates that there is a source of bacteria reaching the well. To use Well 1 as a new community water system for BLR, EPA may require additional testing due to the positive test for E.coli. One assessment that EPA may require is a GUDI (Groundwater Under the Direct Influence of surface water), which refers to situations where microbial pathogens can travel from surface water through an aquifer to a water well. If the well is not GUDI, then the well falls under the Groundwater Rule. If the well is GUDI, the well is treated as surface water and the well water would be required to have filtration and meet other USEPA Safe Drinking Water Act (SDWA) requirements.

The ARRA well is less than 60 meters from the Powers Creek and Mad River and is sited in alluvial materials, factors that do not meet some of criteria of a non-GUDI groundwater. Further investigation to determine if there are significant particulates from surface water in the well may be necessary. This is determined using Microscopic Particulate Analysis (MPA) in accordance with the method described in U.S. EPA, 1992.[5] A minimum of two MPA samples shall be collected. The samples are to be collected during periods when there is the greatest probability that surface water is impacting groundwater (during wet weather season). If the MPA score is medium or high risk, the well will need a filtration system once will be under the LT2 Rule (Long Term 2 Enhanced Surface Water Treatment Rule). If the well is a non-GUDI, disinfection with chlorination treatment will be enough to protect against bacteriological contamination. Chlorination will not remove nitrate, any heavy metals and many other compounds from water, but is efficient to treat Coliform.

To what degree will the project improve the ability to predict the onset of drought earlier and/or with more certainty? To what degree will the project improve the ability to anticipate the severity and magnitude of drought? To what degree will the project improve the likelihood/timing of detecting mitigation action triggers?
The SWG project infrastructure improvements increase the reliability of water supplies by: 1) adding a new primary treated water source, 2) creating a new secondary (backup) water source (the existing primary source), 3) allowing for significantly enhanced operational awareness by integration with existing drought prediction tools that provide more accurate probabilistic forecasts, and by integration with models for analyzing and predicting drought conditions (frequency, duration, and intensity).

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[5] USEPA, 1992, “Consensus Method for Determining Groundwaters Under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA).” EPA 9109-92-029.

What are the types and quantities of environmental benefits provided, such as the types of species and their numbers benefited, acreage of habitat improved, restored or protected, or the amount of flow provided?
It is difficult to predict the direct impact of environmental benefits, other than to note that the SWG integrates with BLR's existing land management, which includes a regenerative design model incorporating native, drought resistant landscaping, natural area development, and small-scale sustainable agriculture operations.

Evaluation Criterion B—Drought Planning and Preparedness (20 points)

The BLR Drought Response Plan is a subplan of the Tribal Multi-Hazard Mitigation Plan (TMHMP). This plan addresses drought through identification of trigger conditions for water management measures (based on the severity of the drought conditions). All plans at BLR, including the drought plan, are developed through a collaborative process that includes community meetings and discussion at Tribal Council sessions. The drought plan does not explicitly include consideration of climate change impacts to water resources or drought per se, but it does address different degrees of drought severity, which can be assumed to reflect conditions that might arise from a changing climate. The drought plan does identify the proposed project as a potential mitigation or response action, and the SWG thus implements a tribal goal or need as identified in the drought plan, specifically:

> BLR will monitor current water system capabilities and identify and recommend capital improvements to improve the water system's ability to get through times of drought. The water system must continue to provide for system operation flexibility while providing improved pumping and storage capacity and new technologies to meet the demands of tomorrow.

In addition to the TMHMP, BLR is nearing the completion of a comprehensive Climate Resilience Plan (CRP) funded by the BIA. This comprehensive plan addresses multiple vulnerabilities, and develops risk assessments and cross-sectoral strategies to address potential impacts.

Evaluation Criterion C—Severity of Actual or Potential Drought Impacts to be Addressed by the Project (20 points)

Existing or potential drought conditions in the project area.

The potential drought impacts to specific sectors at BLR if no action is taken are of course uncertain, but not unpredictable. Although it might seem counterintuitive to justify drought planning in the midst of a historically wet year, it is wisest to plan ahead for the inevitable next drought before it is upon us; thoughtful and deliberate preparedness actions can be taken now as opposed to rushed and emergent response and recovery actions. Over the past several years in California, a severe drought created water scarcity issues throughout the state. Humboldt County was not immune to the effects of this broad drought, but is buffered from these scarcities to some extent as well. Even so, competition with the Central Valley for reservoir water in our region, and significant drops in reservoir levels before this winter's rains (the reservoirs have largely recovered), indicate that the citizens of rural Humboldt County must also contend with the dangers of drought. In fact, many of the ancillary impacts of drought, such as air quality impacts (e.g., particulate matter from frequent area wildfires, dust and erosion) and impacts to wildlife habitat, are often more pronounced here as the urban-wildland interface is more pronounced. Severe drought conditions have visited Humboldt County and Blue Lake, and most certainly will again. In 2015, for example, the U.S. Department of Agriculture named Humboldt, Del Norte, Siskiyou, Trinity, Shasta and Mendocino counties as primary natural disaster areas for severe to exceptional drought levels. The figure below (from the U.S. National Drought Mitigation Center) shows the last 17 years of drought history for Humboldt County.

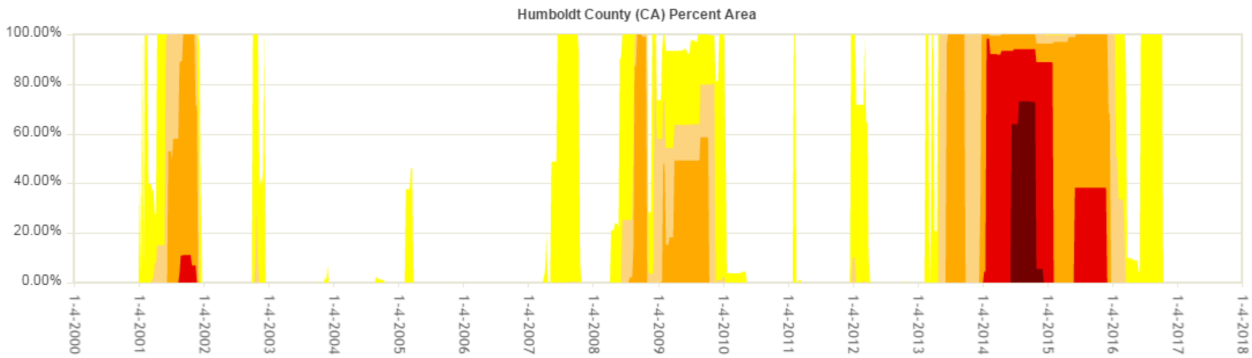

Figure 5. Drought Severity Graph for Humboldt County, 2000-2017. Yellow = least severe (D0), dark red = most severe (D4).

The potential for water scarcity from an extended drought, or the disruption of water service owing to a natural disaster, suggests that a diversity of water sources may be important for minimizing environmental and health impacts, and to minimize potential economic losses associated with drought conditions. As noted above, BLR plays a critical regional role in the event of an emergency (e.g., drought, wildfire, flooding, earthquake, tsunami, severe storm, terrorist act), and providing an additional source of potable water for the region is vital for regional security, health and well-being.

Evaluation Criterion D—Project Implementation (10 points)

Required permits and Approvals

BLR is the Authority Having Jurisdiction (AHJ) on tribal land. The SWG project occurs entirely on trust lands of the Blue Lake Rancheria, California, a federally recognized Native American tribal government, and as such BLR is the lead agency with the authority to issue approval for major tribal actions. Process: tribal staff initiates an Environmental Assessment (EA) for each project, which is then reviewed and processed by Blue Lake Rancheria Environmental Programs Department, in compliance with the Tribe's Environmental Policy Ordinance 02-2000, and all other applicable law. BLR must authorize building projects on the Rancheria.

Process: BLR has adopted building codes used by the State of California. Depending upon the scope of the project, a permit request is presented to the Tribal Council and issued with a Tribal Resolution. All development must comply with the Tribe's adopted building codes and Tribal ordinances. The permitting authority for BLR is the Tribal Business Council of the Blue Lake Rancheria, California. The Business Council receives permit requests and authorizes any and all construction projects on reservation lands. The Tribe has adopted the most recent versions of the National Electric Code, the

Uniform Building Code, the Uniform Plumbing Code, the Uniform Mechanical Code, the National Fire Code and the International Building Code, all as modified by the State of California.

Depending upon the scope of the project, all designs are reviewed by certified and/or licensed inspectors where a third party review is desired. The fire sprinkling plans and underground fire line and appurtenances (hydrants, post Indicator valves, fire department connections) are submitted to the local fire jurisdiction and any/all changes are integrated into the plans. The Tribe conducts Underground Service Alert (USA) services for certain infrastructure on tribal land. Formal plan checks are conducted by licensed third party professionals as needed. In addition, as applicable, projects are reviewed and designed to meet requirements of the local Seismic Zone and sustained wind loads up to 80 mph.

Engineering or design work performed specifically in support of the proposed project. Engineering and design work will conducted by BLR staff with the selected contractor. BLR selects contractors based upon a prequalification system including status of licensing (including appropriate C licenses for sub-trades), appropriate insurance, and performance history. BLR will be soliciting bids from prequalified contractors with experience in design and development of water systems (there are several in our area). We anticipate that subcontractual arrangements will be necessary with a company that specializes in smart grid devices. As with most of its large projects, BLR will be conducting a competitive bid process in which BLR staff: 1) develop bidding documents, 2) advertise for bids, 3) hold pre-bid conferences, 4) review bids, and 5) select contractors.

BLR's SWG project implementation plan includes a breakdown of major tasks needed to complete the project, including the timelines that BLR and its contractors and subs will undertake to complete the project on time and within budget. A robust preliminary project implementation schedule is shown in Table 1 below, which indicates the dates by which major tasks will be completed (in yearly quarters). Refined project management schedules will be developed with the selected contractors.

Table 1. Preliminary Schedule for the SWG—Major Tasks and Timelines

Task	Date Completed
Initial Project Organization	Q3, 2017
RFP Developed, Project Out to Bid, Bids Analyzed	Q4, 2017
Contracts Awarded	Q4, 2017
Construction Completed	Q1-Q2, 2019
Punch list/Commissioning	Q3, 2019
Training	Q3, 2019
Project Close-out 90 days after Completion Date	Q4, 2019

Reclamation expects project awards to be announced by May 2017, with three months before for project initiation. There will be one month of initial preparation for staff to accomplish pre-development tasks associated with addressing any special conditions and/or procedures as required by the funding agreement. BLR anticipates that the SWG will be completely constructed within 12-

18 months, with additional time needed for commissioning and training. Approvals for extensions, if needed, will be obtained from the Reclamation if needed (or possible). In addition to the implementation schedule, a meeting will be held at the beginning of each month to ensure that the project is on time and on budget and address issues that arise. Additional tribal staff, Reclamation staff, and/or outside experts may also attend these meetings.

As the project will be exclusively on Tribal Trust Lands, no additional permits will be required (see above discussion), although all activities will be inspected to levels at or exceeding applicable permits. All activities will also meet guidelines set forth in BLR's Environmental Ordinance.

From 2002-2016, BLR staff have managed the development of over 160,000 square feet of commercial buildings, including the infrastructure for our low-carbon microgrid, which includes some of the most advanced energy technology available. We are very excited to begin the implementation of a new high-tech water infrastructure project.

<u>Describe any new policies or administrative actions required to implement the project</u>. No new policies or administrative actions will be needed.

Evaluation Criterion E—Nexus to Reclamation (10 points)

How is the proposed project connected to a Reclamation project or activity?

There is a direct nexus between the proposed SWG project and a previous Reclamation project. Well 1, the source of the water for BLR's proposed SWG, was completed in 2011 using $250,000 in Reclamation ARRA funds. The SWG project will be physically connected to the Well 1 Reclamation project and is an extension of the goal of the original project which was to "create a fully functional water delivery system from well."

Will the project help Reclamation meet trust responsibilities to any tribe? Yes, the SWG project will help Reclamation meet its trust responsibilities to BLR.

Does the applicant receive Reclamation project water? No.
Is the project on Reclamation project lands or involving Reclamation facilities? No.
Is the project in the same basin as a Reclamation project or activity? Yes, Well 1.
Will the proposed work contribute water to a basin where a Reclamation project is located? No.

V. Performance Measures/Quantification of Benefits

Tribal Goals

The first performance measures that BLR staff takes with regard to any program or facilities initiative here is the extent to which the program helps achieve goals defined by the BLR Tribal Council. In fact, programs or initiatives that do not achieve at least one of these goals are either not pursued or are very low on our priority list. The nine key goals established include:

Social

- Survival, safety, and health of tribal members, staff, and the general public.
- Social justice for tribal members and all native peoples.
- Meaningful opportunities to participate in community life.

Economic

- Continuity of economic enterprise operations and reputations.
- Sustained economic prosperity, productivity and diversification.
- Development of meaningful employment opportunities.

Environmental

- Environmental justice/protections of air & water quality, and the environment.
- 100 percent renewable power (zero GHG emissions).\
- Sustainable resource use (water, materials, etc.)

The SWG project helps BLR achieve all these goals, and is a high priority initiative for the tribe.

Performance Measurement and Smart Systems

The smart sensors and "big data" gathering that is facilitated by the SWG will allow for real-time monitoring of performance measures such as water quantity/quality that will enable better planning and decision-making. Internet-based and wireless technologies, intelligent decision-support systems, and other smart innovations will help BLR improve its water utilization in both steady-state and drought conditions. BLR will explore the availability of additional funding for the integration of a prototype software tool (developed by EPA and Sandia National Lab)—the Community-Based Water Resiliency (CBWR) tool—that uses water distribution network models (in EPANET format) to compute a range of performance metrics; the tool investigates resilience to a wide range of hazardous scenarios and evaluates resilience-enhancing actions.[6]

Using advanced data collection, storage, retrieval, and distribution methods, BLR's water managers will be able to access, interrogate and visualize data and model results through tablets and smart phones. Sensors applied in BLR's water distribution networks will collect information that help managers analyze trends and detect abnormal conditions. These "real-time performance measures" will allow for early detection and rapid response with more accurate identification of where a problem may be occurring in the system.

Performance Measures for Drought and other Hazards

A large number of performance metrics for water distribution systems are available for quantitatively assessing resilience; some metrics are specific to drought, but many are useful for multiple hazards. Time-based resilience metrics provide detailed information about the benefits of resilience-enhancing actions and would allow BLR to explicitly calculate the effects of drought response and recovery

[6] USEPA, 2015. "Systems Measures of Water Distribution System Resilience," EPA 600/R-14/383, www.epa.gov/research.

actions on SWG system components and interactions. In the real world, response actions include multiple actions at different times, and some are taken in the mitigation phase rather than the response phase (e.g., decentralization of treatment and storage as proposed by the SWG.)

Modeling tools and hazard scenarios can be developed to incorporate the effects of different hazards, but this would be an ongoing project for BLR. Because of the wide range of possible hazards and response scenarios, multiple responses would need to be simulated. Scenarios include realistic disaster impacts and responses, including pipe breaks, pump failures, power outages, control valve failures, insufficient storage capacity, multiple stresses occurring at the same time, fire-fighting conditions, and water quality failures. BLR will develop a set of scenarios that represent realistic mitigation and response strategies that might be employed here to reduce consequences of disasters given the uncertainty associated with future events.

It is BLR's hope that the SWG will serve as a demonstration site (functioning alongside BLR's Resilience Training Center) that will allow for data development that can be used to improve simulation software and associated software trainings. Reliability measures that are designed to measure such things as reliability to pipe failures or additional stresses on systems (such as maximum day demands or fire flow conditions) are important considerations. Pipe breaks are a common outcome of many hazards, so reliability metrics will be important to develop for BLR. Even so, we are hoping to identify robust resilience measures that can be extended to additional hazard scenarios that lead to not just to pipe breaks, but failures of pumps and valves and/or loss of access to storage tanks or sources. This is particularly important when considering the drought conditions at BLR could easily co-occur with other, sometimes quite severe, hazard events.

Other Relevant Performance Measures

Many resilience-related performance measures for water distribution networks have been proposed in the research literature and are discussed below:

<u>Reliability, robustness, and redundancy</u>. Reliability is usually defined as: 1) the probability that the system performs its mission within specified limits for a given period of time under certain conditions, or 2) as the probability that the system can provide the demanded flow rate at the required pressure head under normal, fire flow, and emergency conditions. Both of these measures of reliability will be monitored for the SWG. Robustness is a similar idea, but focuses on the ability of the system to maintain function during abnormal conditions. Redundancy is the duplication of critical components in a system with the intention of increasing reliability.

<u>Resilience Indices</u>. BLR will consider using the Argonne National Laboratory Resilience Index,[7] 2010), which measures the resilience of critical infrastructure, including drinking water and wastewater systems. The Index combines more than 1,500 variables into a composite index that measures robustness, recovery and resourcefulness, and produces an overall score from 0 (low resilience) to 100 (high resilience). For water systems, the system includes physical components such

[7] Fisher, R. E., et al. (2010). "Constructing a Resilience Index for the Enhanced Critical Infrastructure Protection Program." U.S. Department of Homeland Security.

as water sources, treatment plants, storage tanks, pumping stations, and pipe distribution networks that deliver water. The index measures variables on redundancy, prevention, and ability to maintain key functions. Recovery combines variables measuring restoration and coordination. "Resourcefulness" combines variables measuring training, awareness, protective measures, stockpiles, response, new resources, and alternative sites.

Cost, Water Quality and Water Pressure. To evaluate cost, both the capital and operational costs associated with any change to the system have to be considered. Capital costs are related to purchases of new components and are dependent on the component size, labor, transportation, and installation. Operational costs are related to the energy costs associated with operating pumps and generators and maintenance costs. For water quality, water age is the time that a specific volume of water is in the water distribution system after leaving the treatment plant or reservoir; water system managers try to minimize water age (also called residence time) as chlorine residuals are known to decay and disinfection byproducts increase over time. We do not anticipate this as a concern at BLR, but we will monitor this nonetheless.

Water distribution networks must maintain adequate water pressure throughout the network to ensure continuity in service and for fire suppression. Low water pressure can result in flow reductions and high water pressure can cause leaks and damage to system components. Pressure is controlled in the network by pumps and the elevation of storage tanks. Aside from pipe leaks and water consumption, pressure is lost in the system due to pipe friction. A systems analysis can be performed to ensure that the SWG meets pressure range requirements under normal operating conditions and when the system is stressed by component failure or changes to operations, such as when the system needs an adequate amount of pressure to fight fires (here the tie-in to the municipal water system, which would serve as a backup to the SWG, is important).

Some Takeaways

Performance measures and standards are being deployed at BLR to facilitate communication and transparent information sharing across the tribal community, and across infrastructure sectors, regionally and nationally. Because the technical field of smart water grids is relatively new (even if systems such as SCADA are not), effective information sharing can play an important educational role, engaging all stakeholders with real (hopefully compelling) data that can improve buy-in and create incentives for further smart-technology-related resilience investment.

Tribal resilience is thus not just an outcome, but a process. Documenting the steps BLR takes to reach its tribally-defined goals demands performance measures that reflect these goals—what the specific measure is designed to achieve in relation to the overarching goals. Further, it will be important to provide the community with information on drought and other hazards, and how our use of water and energy infrastructures can best respond to these hazards. Such transparent communication helps engage the community with goal setting, as they better understand the risks and contribute to make good resource decisions. This is a sharing of responsibility, for sure, but also gets at the key issue of a community's risk tolerance and willingness to share in creating solutions.

BLR Smart Water Grid (SWG) Project Budget

The project budget below includes:

- Funding plan
- Budget proposal
- Budget narrative

Table B1. Existing Infrastructure Used as In-Kind

Component	Total for SWG
Design and Engineering	$10,638
Preliminary Survey	$356
Clearing and Grading	$35,647
Water Development and Delivery	$45,222
Electric Service	$13,562
Relocation of Buildings	$1,524
PG&E Utility Design and Installation	$18,468
TOTALS	$125,416

Cost-Share: 2012 Infrastructure Project. In 2012, BLR installed connective water infrastructure between Well 1 and the Rancheria water system in preparation for future development, including the development of the tribal smart water gird (SWG) system and management facility. The infrastructure contribution is critical to the success of the project as it provides connectivity to existing and proposed future facilities. Bruce Ryan, BLR Tribal Construction Manager, developed the detailed breakdown of the $125,416 of in-kind infrastructure development costs, as shown in Table B1. These costs represent 10 percent of BLR's 2012 water system infrastructure expenditures; 10 percent is a conservative estimate of the portion of the 2012 project that is reasonably attributable to the purposes and needs of the SWG project.

Cost-share, land valuation. Robust estimates of the land required for the various SWG components, with some buffer, is approximately .5 acres. The land valuation developed here for a .5-acre-sized parcel is based on an extrapolation of land value based on realtor values (Zillow, 2016) and sales, as shown in Table B2 below. The most comparable lot was 415 Chartin Road (in italics), which is adjoining BLR; the sale price for this parcel (over $412,946/acre) reflects a premium for property near the Rancheria. We incorporated estimates from other comparable lots in the area to develop an estimated average .5-acre lot cost of $58,851. To make the project budget equal to $600,000 (for ease of in-kind computation), we valued the land contribution at a reduced amount of $26,362.

Table B4: Summary of Non-Federal and Federal Funding Sources

FUNDING SOURCE	AMOUNT
Non-Federal Entities	
1. Blue Lake Rancheria	$300,000
Non-Federal Subtotal	$300,000
Federal Entities	
1. Reclamation	$300,000
Federal Subtotal	$300,000
Requested Reclamation Funding	$300,000

Budget Narrative

Salaries and Wages

Program manager: David Narum, Ph.D., BLR Resilience Manager; direct labor rate: $42/hour, 12 percent of time (minimum).

Other key personnel: Mike Smith, Facilities Director; direct labor rate: $49/hour; 8 percent of time (minimum).

IT Technicians: $35/hour; 18 percent of time (minimum).

Facilities personnel: $25/hour; 16 percent of time (minimum).

These labor costs are based on hours minimum hours estimates based on conversations with staff; labor costs will be allocated to specific tasks for the SWG once the project bid is received and accepted. The project managers estimated hours include time for compliance with reporting requirements (final project and evaluation), based on section F.3 of the FOA (p. 49). Salary increases cannot be estimated at the time of this proposal. Salaries of administrative and/or clerical personnel are included as a portion of the in-kind indirect costs.

Staff duties will include (but are not limited to) the following:

- Project Manager: managing/leading the project team; recruiting contractors; managing coordination among participants; detailed project planning, including: 1) developing and maintaining a project plan, 2) managing project deliverables, 3) managing scope and change control, 4) monitoring project progress and performance, 5) providing status reports to Reclamation, and 6) managing staff training.
- Facilities Director: liaison with Project Manager and assists Project Manager with contractor recruitment; oversees the functioning and integration of infrastructure systems including mechanical, electrical, and fire/life safety; oversees smart water grid contractors; manages Facilities personnel activities on the project, in particular the development of staff expertise on using smart water grid technologies for water system management.

- IT Technicians: integration of SWG systems into BLR's infrastructure management system; real-time monitoring of SWG conditions, water pressure and quality, water usage, etc.; assisting the Facilities Department with decision support tools, such as predictive hydraulic modelling, valve operation simulation, demand prediction mode and pipe failure analysis (among many other monitoring parameters); help BLR staff improve water network assessments and planning.
- Facilities personnel: report to the Facilities Director on tasks during the construction pahse and tasks involving the functioning and integration of smart water grid water infrastructure systems into BLR's networked infrastructure communications systems; train and develop expertise in smart water grid technologies for water system management.

Fringe Benefits. Fringe rates vary at BLR but benefit packages are generous. For the In-kind match we used 30 percent for the fringe (used for application purposes only); as noted above, estimated staff hours for the project are minimums.

Travel. We have not budgeted for travel costs.

Equipment. We have estimated equipment costs of $160,000 for the SF-424C form. Firm equipment cost estimates will be developed after the project bids are accepted for the following components (the list is not all-inclusive):

1) flow restrictors/ meters
2) chemical injection pump(s)
3) pressure pumps and controllers (vertical multistage booster pumps)
4) water treatment units
5) water storage tanks
6) filters
7) valves
8) water softener units
9) smart grid technologies (devices, software, training, etc.)

Contractor's bids will itemize costs of all equipment having a value of over $5,000 and include information as to the need for this equipment, and how the equipment is priced. We have included BLR staff training costs in the estimate of smart grid devices and software costs.

Materials and Supplies. As with the Equipment costs, supplies will be categorized by major category, unit price, quantity, and purpose (for office use, research, or construction) after the project bid is accepted and the project management framework has been developed. These costs will be estimated from one or a mix of quotes, past experience, engineering estimates, or some other methodology.

Contractual. As noted in the main proposal, contractor's costs have been estimated from existing bids for a water system, excluding smart grid technologies; these estimates are approximately $230,000. Discussions with smart grid technology companies yielded a range of costs. We have estimated the costs of including smart technologies for this project phase at $70,000 for the purposes of maximizing the grant request. Even so, we consider the $300,000 request to be the maximum contractor costs, and are expecting bids to come in under this amount. Contractor costs were itemized on the SF-424C form, but those are estimates that will need to be refined and likely re-allocated upon project funding. Detailed budget estimates of time, rates, supplies, and materials that will be required for each task will be required of all bidders. BLR will identify how the budgeted costs for contractors were determined to be fair and reasonable.

Environmental and Regulatory Compliance Costs. BLR has not identified environmental compliance (EC) costs nor do we anticipate such costs. If EC costs do arise, BLR will work with Reclamation to review EC documentation to review the Federal award amount for possible adjustments to cover such costs. If such an adjustment occurs, and any portion of the funds budgeted for EC is not required for compliance activities, such funds may be reallocated back to the project, if appropriate.

Other Expenses. Other expenses not included in the above categories (and currently not known) will be covered by BLR as in-kind.

Indirect Costs. BLR's negotiated indirect cost rate is 47.8%. We used indirect costs on staff wages as an in-kind match (excluding project manager wages from this calculation).

BLR Drought Planning (in progress; Draft 2015)

Before the occurrence of a water supply shortage and the need to implement emergency provisions, "pre-response" measures should be taken with the aim of conserving water: 1) identification of major water uses of the system, 2) implementing a water user education program for water use reductions. An effective outreach program will keep users informed about the water supply situation, the actions to be taken to mitigate drought emergency problems, and how well the water system is doing. Keeping water users involved, informed, and participating in the decision-making process is a key component of effectively implementing an effective Drought Management Plan, 3) informing the local media (if appropriate) in both print and local news programs.

Designation of Drought and Water Shortage Conditions

BLR's Drought Management Plan consists of a combination of conditions that trigger or initiate water usage mitigation activities. The following categories of Drought Action Phases are used: Moderate Drought Phase A, classified as a DO to D1 (Dry or Moderate) as designated by the US Department of Agriculture:

- Difficulty in Refilling Storage Tank(s)
- Daily Well Production at 30% over Previous Month Average
- Monthly Water Use 30% above Previous Month Average
- Drop in Static Well Level that Exceeds 3 feet
- Low Pressure Complaints Received During Peak Demand Periods
- No Measurable Precipitation for 7 days

Drought classified as a D2 (Severe):

- Inability to Refill Storage Tank(s)
- Daily Well Production at 50% of Previous Month Average
- Monthly Water Use that is 50% above Previous Month Average
- Drop in Static Well Level that Exceeds 5 feet (vertical turbine)
- Drawdown Interference noted when running wells in combination
- Low Pressure Complaints During Peak Demand Periods
- Areas in the Water System with Pressure below 20 psi
- Some Deterioration of Water Quality Caused by High Flow Conditions
- No Measurable Precipitation for 2 weeks
- Problems maintaining water pressure at critical facilities such as hospitals or urgent care centers

Drought classified as a D3 or D4 (Extreme or Exceptional)

- Inability to Refill Storage Tank(s)
- Draining of Storage Tank Under Peak Demand Conditions

- Daily Well Production at 50% over Previous Month Average
- Well run log that exceeds 2 times daily average
- Monthly Water Use that is 50% above Previous Month Average
- Drop in Static Well Level that Exceeds 5 feet (vertical turbine)
- Drawdown Interference noted when running wells in combination
- Low Pressure Complaints During Peak Demand Periods
- Low Pressure Complaints During Peak and Non-Peak Periods
- Areas in the Water System with Pressure below 20 psi
- Demands that exceed WTP permitted capacity
- Deterioration of Water Quality Caused by High Flow Conditions
- Exceeding Engineering Demand Estimates for Current Period
- No Measurable Precipitation for 4 weeks
- Problems maintaining water pressure at critical facilities such as hospitals or urgent care centers

Drought Management Plan Mitigation Efforts

Description Water System Ability to Maintain System Reliability

BLR will monitor current water system capabilities and identify and recommend capital improvements to improve the water system's ability to get through times of drought. The water system must continue to provide for system operation flexibility while providing improved pumping and storage capacity and new technologies to meet the demands of tomorrow.

A capacity analysis can help identify how past efforts have enhanced the system's ability to meet demand during drought conditions. Typically it will be necessary to also update the system's ongoing capital improvement program over the next five years. A cost of service study can be conducted to evaluate the true and proposed costs associated with providing water to customers under drought conditions, taking into consideration the impact of using any treatment capacity, the timing of future expansions, maintaining compliance, funding operating requirements and the costs of, engineering design, and permitting.

Water Conservation Planning Benefits

Common water conservation measures have been demonstrated to be effective for small water systems, and include: Basic Water Conservation, Intermediate Water Conservation, and Advanced Water Conservation. These measures are implemented over a period of one to ten years.

Drought Management Phases, Conservation Goals, Metrics and Water Conservation Measures

Drought Designations and Water Use Requirements

To reduce non-essential water demand, restrictions on the delivery and consumption of water are adopted. These restrictions are keyed to the declared drought phase.

Moderate Drought Phase Goals and Restrictions

BLR facilities staff will make the determination if a moderate water supply shortage exists based on trigger levels. Upon this determination, BLR will seek voluntary reductions in the use of water for all purposes and voluntary reductions on using water during certain peak water demand periods. The goal during a Moderate Drought Phase is to achieve at least a reduction of 20% in residential water use and 15% in other water uses such as commercial, industrial, institutional and irrigation; and a reduction in overall water use of 15%.

To accomplish these goals, the Water System will use the following metrics: Reduce average domestic water use to at minimum an average of 130 gallons per customer per day or 8,000 gallons per household per month. Voluntary water conservation measures to be implemented during the *moderate drought* phase include: 1) eliminate the washing down of sidewalks, walkways, driveways, parking lots, and other hard surfaced areas, 2) eliminate the washing down of buildings for purposes other than immediate fire protection, 3) eliminate the flushing of gutters, 4) eliminate the washing of motorcycles, motorbikes, boats, cars, etc., 5) eliminate the use of water to maintain fountains, reflection ponds and decorative water bodies for aesthetic or scenic purposes, except where necessary to support aquatic life, 6) reduce watering of lawns, plants, trees, gardens, shrubbery and flora on private or customer property to the minimum necessary; encourage outdoor watering to be done during off-peak hours, 7) 8) intensify maintenance efforts to identify and correct water leaks in the distribution system, 9) cease to install new irrigation taps on the water system, 10) continue to encourage and educate customers to comply with voluntary water conservation.

Severe Drought Phase Goals and Restrictions: BLR will determine if a severe water supply shortage exists based on trigger levels. Upon this determination, the Water System will seek mandatory reduction in the use of water for all purposes and mandatory restrictions on non-essential usage and restrictions on times when certain water usage is allowed. Specifically, the goal during this phase is to achieve at least a reduction of 25% in residential water use, 20% in all other water use categories, and a reduction in overall water use of 20%. To accomplish these goals, BLR will use the following metrics: The water reduction goals during a Severe Drought Phase is to achieve a reduction of average water use by domestic customers to 120 gallons per household per day or an average of 6,000 gallons per household per month.

The following mandatory severe drought water conservation measures that will be in force until lifted by the water provider: mandatory water conservation measures implemented during the severe drought phase: 1) eliminate the washing down of sidewalks, walkways, driveways, parking lots, and other hard surfaced areas, 2) eliminate the washing down of buildings for purposes other than immediate fire protection, 3) eliminate the flushing of gutters, 4) eliminate the washing of motorcycles, motorbikes, boats, cars, etc., 5) eliminate the use of water to maintain fountains, reflection ponds and decorative water bodies for aesthetic or scenic purposes, except where necessary to support aquatic life, 6) reduce watering of lawns, plants, trees, gardens, shrubbery and flora on private or customer property to the minimum necessary; encourage outdoor watering to be done during off-peak hours, 7) 8) intensify maintenance efforts to identify and correct water leaks in the distribution system, 9) cease to install new irrigation taps on the water system, 10) continue to encourage and educate customers to comply with voluntary water conservation.

RESOLUTION NO. 17-04

RESOLUTION OF THE BUSINESS COUNCIL OF THE BLUE LAKE RANCHERIA, CALIFORNIA, FOR A PROPOSAL TO THE U.S. BUREAU OF RECLAMATION FOR A DROUGHT RESILIENCE CAPACITY-BUILDING PROJECT

WHEREAS: The Blue Lake Rancheria, California is a federally recognized Indian Tribe organized under a tribal constitution approved by the Secretary of the Interior pursuant to Section 16 of the Indian Reorganization Act (IRA; 25 U.S.C. §476); and

WHEREAS: The Blue Lake Rancheria Constitution has been approved by the Assistant Secretary of the Indian Affairs on March 22, 1989, and revised and approved by the Assistant Secretary of Indian Affairs on February 11, 1994, establishing the duly elected Business Council as the governing body of the Tribe; and

WHEREAS: The governing body of the Tribe is the Business Council; and

WHEREAS: Under the Blue Lake Rancheria Constitution the Business Council has the power to engage in programs/projects which promote the health and well-being of the tribe; and

WHEREAS: The Blue Lake Rancheria is proposing to develop a project to promote health and well-being that includes capacity-building for drought resilience and water management through trainings, and through the use of smart technologies, controls, and enhanced storage and distribution infrastructure; and

WHEREAS: The Blue Lake Rancheria requests assistance in an amount not greater than $300,000 from the Bureau of Reclamation (BOR), with the Tribe committing at least 50 percent in-kind match including services and funds; and

WHEREAS: The Blue Lake Rancheria, in accordance with federal guidelines, has Tribal fiscal policies and procedures consistent with generally accepted accounting principles, and grant internal control procedures in accordance with federal guidelines; and

NOW, THEREFORE, BE IT RESOLVED, the Blue Lake Rancheria, California, Tribe has reviewed and does hereby approve the submittal of an application to the BOR for an amount not greater than $300,000, with Blue Lake Rancheria committing a 50 percent in-kind match of services and funds, for the further development of the Blue Lake Rancheria Drought Resilience Program.

CERTIFICATION

As the Chairperson of the Blue Lake Rancheria Tribal Business Council for the Blue Lake Rancheria, California, I hereby certify that the Blue Lake Rancheria Tribal Business Council adopted this resolution at a duly called meeting with a quorum present by a vote of 5 for, Ø against, Ø Abstaining, and Ø absent on this 1st day, of February 2017.

Claudia Brundin | 2-1-17

Claudia Brundin, Chairperson | Date of Approval

ATTEST: | 2-1-17

Emily Stokes, Tribal Executive Secretary | Date of Approval

Mad River Alliance
P.O. Box 1252
Blue Lake, CA 95525

February 10, 2017

Darion Mayhorn
Bureau of Reclamation
Water Resources and Planning

RE: Blue Lake Rancheria's WaterSMART proposal

Dear Mr. Mayhorn:

The Mad River Alliance is a community-driven group working to protect clean local water and the ecological integrity of the Mad River watershed for the benefit of its human and natural communities. The Mad River Alliance is a tax-exempt, 501(c)3 non-profit located in Blue Lake, California.

We are writing to express our support for the Blue Lake Rancheria's proposal for funding for a Drought Resiliency Program- a "Smart Water Grid." The Tribe's goal of developing its own water treatment and storage system will be valuable for our rural emergency management, particularly for droughts and other natural disasters. The Blue Lake Rancheria (BLR) is a Red Cross Shelter in Place evacuation site and this project will help ensure that the Tribe can meet the needs of tribal members and potential thousands of evacuees. The project indicates BLR's commitment to the resilience, health, and well-being of the Tribe and the region.

The Blue Lake Rancheria and Mad River Alliance are both committed to the health and sustainability of the Mad River watershed and its communities. Rural regions are in critical need of diverse and resilient potable water sources that both respond to the potential for drought and work to preserve the environment.

We encourage you to fund this proposal to help our rural communities respond to water shortages or loss of infrastructure in a disaster.

Sincerely,

Dave Feral
Executive Director

CCRP
California Center for Rural Policy

HUMBOLDT
STATE UNIVERSITY

February 10, 2017

Darion Mayhorn
Bureau of Reclamation
Water Resources and Planning

Dear Mr. Mayhorn:

I am writing to express my support for the proposal from the Blue Lake Rancheria (BLR) for funding for a Drought Resiliency Program. BLR's project includes water management infrastructure, landscaping, training, and a resilience-related business incubator. The tribe's goal of having an independent water system will be valuable for our rural emergency management, including for droughts and other natural disasters. BLR's role as a Red Cross evacuation site indicates their commitment to resilience and the health and well-being of the surrounding region and also signals another critical need for this funding from BOR.

It is my understanding that the Blue Lake Rancheria is seeking to develop a high-tech, "smart" water grid. My organization, the California Center for Rural Policy (CCRP) at Humboldt State University, believes that rural regions have as much to gain (if not more) from the development and implementation of smart technologies. As such, we are big believers in this idea. CCRP is committed to informing national, state and local policy, building rural communities and regions, and fostering the health and well-being of all. We thus fully support BLR's efforts on resilience in general, and resilience to drought in particular.

Blue Lake Rancheria's efforts to develop new programs and economic enterprises around resilience provide critical regional resources that will benefit people here and elsewhere.

Respectfully,

Constance E Stewart

Constance E. Stewart
Executive Director

California Center for Rural Policy, Humboldt State University, 1 Harpst Street, Arcata, CA 95521

Office: 707.826.3400 Fax: 707.826.3403 http://www.humboldt.edu/ccrp/