NEBRASKA NATURAL RESOURCES COMMISSION

Water Sustainability Fund

Application for Funding

Section A.

ADMINISTRATIVE

PROJECT NAME: Remote Telemetry Upgrades on Flow Meters for Groundwater Irrigation Management

SPONSOR'S *PRIMARY CONTACT INFORMATION* **(Not Consultant's)**

Sponsor Business Name: **Lower Elkhorn Natural Resources District**

Sponsor Contact's Name: Julie Wragge

Sponsor Contact's Address: 1508 Square Turn Blvd., Norfolk, NE 68701

Sponsor Contact's Phone: 402-371-7313

Sponsor Contact's Email: jwragge@lenrd.org

1. **Funding** amount requested from the Water Sustainability Fund:

   Grant amount requested. $ 169,242.00

   - If requesting less than 60% cost share, what %? N/A

   If a loan is requested amount requested. $ N/A

   - How many years repayment period? N/A
   - Supply a complete year-by-year repayment schedule. N/A

2. **Neb. Rev. Stat. § 2-1507 (2)**

   Are you applying for a **combined sewer overflow project**? YES☐ NO☒

   If yes:

- Do you have a Long-Term Control Plan that is currently approved by the Nebraska Department of Environmental Quality? YES☐ NO☒
- Attach a copy to your application. N/A
- What is the population served by your project? N/A
- Provide a demonstration of need. N/A
- **Do not complete the remainder of the application.**

3. **Permits Required/Obtained** Attach a copy of each that has been obtained. For those needed, but not yet obtained (box **"NO"** checked), 1.) State when you will apply for the permit, 2.) When you anticipate receiving the permit, and 3.) Your estimated cost to obtain the permit.

(N/A = Not applicable/not asking for cost share to obtain)
(Yes = See attached)
(No = Might need, don't have & are asking for 60% cost share to obtain)

G&P - T&E consultation (required)	N/A☐ Obtained: YES☐ NO☒
DNR Surface Water Right	N/A☐ Obtained: YES☐ NO☒
USACE (e.g., 404/other Permit)	N/A☐ Obtained: YES☐ NO☒
FEMA (CLOMR)	N/A☐ Obtained: YES☐ NO☒
Local Zoning/Construction	N/A☐ Obtained: YES☐ NO☒
Cultural Resources Evaluation	N/A☐ Obtained: YES☐ NO☒
Other (provide explanation below)	N/A☐ Obtained: YES☐ NO☒

4. **Partnerships**

List each Partner / Co-sponsor, attach documentation of agreement:
N/A

Identify the roles and responsibilities of each Partner / Co-sponsor involved in the proposed project regardless of whether each is an additional funding source.

N/A

5. **Other Sources of Funding**

Identify the costs of the entire project, what costs each other source of funding will be applied to, and whether each of these other sources of funding is confirmed. If not, please identify those entities and list the date when confirmation is expected. Explain how you will implement the project if these sources are not obtained.

LENRD's budget comes from a mill levy assessed to property values. The budget is set on a yearly basis and has remained steady for several years. A portion of the budget has been allocated to ensure there is sufficient funding to cover LENRD's 40% match for this project.

The LENRD's operating budget for Fiscal Year 2023 was approved by the Board of Directors at their September meeting with a tax request of $4,522,473. The estimated levy, based on the property tax request, is 2.2968 cents per $100 of valuation, which is a decrease of 1.15% from the fiscal year 2022 levy of 2.3236 cents per $100 of valuation.

6. **Overview**

In 1,000 words *or less*, provide a brief description of your project including the nature/purpose of the project and its objectives. Do not exceed one page!

The Lower Elkhorn Natural Resources District (LENRD) is proposing an innovative real-time operational irrigation water management program that will initiate the installation of remote telemetry equipment to track water supply use for groundwater irrigated acres within its northeast Nebraska boundaries. Upon the successful award of this proposal, the LENRD will utilize funds from their budget, along with the Nebraska Department of Natural Resources (NDNR), to deploy near real-time telemetry equipment on **90** irrigation flow meters for improved on-farm water management and reporting of water use data.

The LENRD has established groundwater management areas to improve and protect groundwater quality in the district. One of the major components of a groundwater management area is a phased approach of regulation that requires varying degrees of reporting and best management practices to minimize the impact of agricultural chemicals on groundwater.

One of the requirements of the LENRD Groundwater Management plan is the installation of a flow meter on all new wells. In addition, permanently-installed totalizing flow meters have been required on all irrigation wells since **Jan 1, 2018**. The LENRD board of directors recognizes that an adequate supply of groundwater is one of our

most vital resources, and that accurate groundwater use information benefits the public and is a valuable tool for managing groundwater. Monitoring groundwater withdrawals provides essential information to evaluate well interference complaints, to understand the resilience of groundwater to pumping stresses, and to advance the LENRD's understanding and management of this publicly owned resource. Knowing the rate and volume of groundwater pumped provides well owners with information necessary to improve irrigation and pumping plant efficiencies, discover well and pump problems, and conserve groundwater and energy resources. Along with the requirement of this management mechanism comes the need for upgrades as technology is rapidly changing. The need for remote telemetry equipment has been realized for several flow meters in management area locations.

Due to the severe drought effects that Northeast Nebraska has experienced since 2022 LENRD has implemented and enforced groundwater allocations of 15 inches per acre across the entire district. In addition, LENRD maintains administration of two Groundwater Quantity Subareas where allocations range from 12 to 18 inches/acre. Finally, new wells in the district in the district have been granted a 9 inch/ac allocation. These 179 irrigation wells will be given priority in this proposal by targeting 50% or **90** of these wells to upgrade these meters to telemetry to improve irrigation water management through near real-time telemetry, conserve water, and achieve better compliance with allocations.

Being proactive in the conjunctive management of groundwater and surface water is what led the LENRD's board of directors to implement a voluntary Integrated Management Plan (IMP) for the protection of the resources. The citizens of the LENRD depend on abundant water resources for domestic, agricultural, and industrial uses, all of which contribute to the economy of the district. Water resources are also important for wildlife habitat and recreational uses such as fishing, hunting, boating, and swimming. In early 2012, the LENRD board took action to initiate development of a joint voluntary IMP with the Nebraska Department of Natural Resources (NeDNR), to provide a needed framework for wise, long-term management of finite water resources. The plan was approved in September of 2018.

The purpose of the voluntary plan is to achieve and sustain a long-term balance between water uses and water supplies. Protection of existing users is also a major factor since there is still available water in the Basin, and the district is continuing to add new users on an annual basis. This will be achieved through coordinated management of hydrologically connected groundwater and surface water resources. The IMP is considered a proactive approach to protecting available water supplies to better ensure that the resource will be available for future generations and makes the LENRD eligible to apply for grant funding through the NeDNR Water Sustainability Fund.

This project would continue the valued partnership the LENRD has with the NeDNR as we work together to build a robust hydrogeologic framework across the 15-county district. By updating the technologies used to record groundwater use, we are complimenting the information we have already gathered, with the help of NeDNR and

the WSP, through the aerial electromagnetic (AEM) projects and the Groundwater Modeling effort.

This project is expected to last two years, beginning in the winter of 2024 and ending in 2026.

7. **Project Tasks and Timeline**

Identify what activities will be conducted to complete the project, and the anticipated completion date.

Task	Yr1	Yr2	Total
Equipment	$ 88,065.00	$ 88,065.00	$ 176,130.00
Supplies/Materials	$ 7,970.00	$ 7,970.00	$ 15,940.00
Telemetry Installation	$ 22,500.00	$ 22,500.00	$ 45,000.00
Program Administration	$ 11,250.00	$ 11,250.00	$ 22,500.00
Data Acquisition/Processing	$ 11,250.00	$ 11,250.00	$ 22,500.00
		Total	$ 282,070.00

Jan, 2024 - Apr, 2024

- Publicize program to farmers in Allocation Areas
- Take applications
- Initiate Upgrades on ~15 Irrigation flow meters

Oct, 2024 – Apr, 2025

- Publicize program to farmers in Allocation Areas
- Take applications
- Complete Upgrades on 70-75 Irrigation flow meters

Oct, 2025 – Dec, 2025

- Publicize program to farmers in Allocation Areas
- Take applications
- Complete Upgrades on additional irrigation flow meters provided that funding remains

8. **IMP**

Do you have an **Integrated Management Plan** in place, or have you initiated one? YES☒ NO☐ Sponsor is not an NRD☐

Section B.

DNR DIRECTOR'S FINDINGS

Prove Engineering & Technical Feasibility

(Applicant must demonstrate compliance with Title 261, CH 2 - 004)

1. Does your project include physical construction (defined as moving dirt, directing water, physically constructing something, or installing equipment)?
YES☐ NO☒

If you answered "YES" you must answer all questions in section 1.A.
If you answer "NO" you must answer all questions in section 1.B.

If "YES", it is considered mostly structural, so answer the following:

1.A.1 Insert a feasibility report to comply with Title 261, Chapter 2, including engineering and technical data;

1.A.2 Describe the plan of development (004.01 A);

1.A.3 Include a description of all field investigations made to substantiate the feasibility report (004.01 B);

1.A.4 Provide maps, drawings, charts, tables, etc., used as a basis for the feasibility report (004.01 C);

1.A.5 Describe any necessary water and/or land rights including pertinent water supply and water quality information (004.01 D);

1.A.6 Discuss each component of the final plan (004.01 E);

1.A.7 When applicable include the geologic investigation required for the project (004.01 E 1);

1.A.8 When applicable include the hydrologic data investigation required for the project (004.01 E 2);

1.A.9 When applicable include the criteria for final design including, but not limited to, soil mechanics, hydraulic, hydrologic, structural, embankments and foundation criteria (004.01 E 3).

If "NO", it is considered mostly non-structural, so answer the following:

1.B.1 Insert data necessary to establish technical feasibility (004.02);

The battery-powered telemetry units that will be deployed under this program utilize cellular telemetry communications eliminating the need for commercial power sources to power the telemetry system. Since each system will be a cellular node, the communications system will be independent of a capital-intensive system of towers and radio repeaters that would be necessary for a traditional radio telemetry system.

LENRD has communicated with other NRDs that employ several staff members that regularly read irrigation flow meters installed in the district that drive up to **50,000 miles/year** in a three-month period. These districts that have installed telemetry for automated meter reading for irrigation flow meters have reduced the number of miles driven by approximately 50% and are accomplishing this with fewer technicians. The district projects that this technology, if widely adopted, could reduce miles driven by at least **75%** for district employing conducting meter reading. Other districts that have explored similar radio networks have discovered costs for such a system to radio towers that would cost approximately $70,000 per site (not including land costs) and communications equipment at the well to be nearly $4,000 per site. A radio network that would cover even a small portion of LENRD would cost at least $1,000,000 not including land acquisition, design, or integration costs to the district's computer system.

Achieving the goals of this project would not be possible without the deployment of real-time telemetry. The technology proposed would provide daily readings to farmers within allocation areas of LENRD for improved water management which would be technically and economically impossible compared to driving to the site for physical readings. Approval of this proposal will prevent thousands of miles driven and in turn the production of greenhouse gases by LENRD employees in the future. In addition, the cellular technology proposed prevents the need for significant capital outlay by the district compared to similar radio-based networks.

1.B.2 Discuss the plan of development (004.02 A);

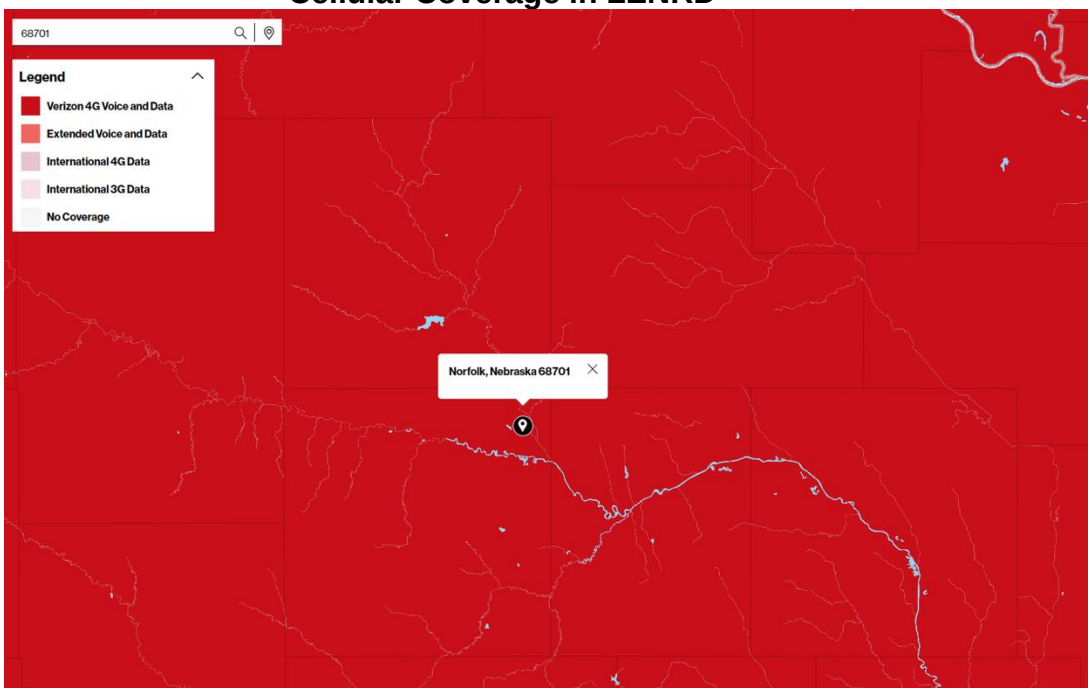
LENRD has required flowmeters on all irrigation wells in the district since January 1, 2018. Currently much of the district is in D3 or D4 (Extreme or Exceptional Drought) as designated by the U.S. Drought Monitor. At the October 2022 LENRD Board meeting, the Ad-hoc Drought Response Committee decided to limit the amount of groundwater use in 2023 to 15 inches/ac for portions of the district that did not yet have an allocation. Other portions of the district exist where approximately 400 wells already have an allocation of **9** inches/acre. LENRD District staff plan to target these allocation areas under this project to improve irrigation water management by obtaining near real-time water use on at least **90** irrigation wells. Farmers in these areas have had difficulty in complying with allocations because they do not have the capability of remote meter monitoring. This project will deploy cellular remote telemetry technology on **90 irrigation flow meters** improving the irrigation management on an estimated **11,000 acres**. The predominant irrigation flow meter in the district is the mechanical McCrometer propeller meter. Remote technologies exist from McCrometer that integrate built-in communications to the meter for transmitting accurate, reliable irrigation flow data. This innovative design eliminates cables, pole mounting, solar

panels, and other components – removing unnecessary costs and improving data quality by reducing opportunities for noise interference or cable damage. These technologies are also capable of transmitting the totalizer reading from the meter's register in the field to ensure that this and the totalizer remotely viewed on the web are always the same. LENRD will make use of WSF funds from the NE DNR combined with district funds to contract with a meter service provider to upgrade existing meters within the above-mentioned allocation areas with built-in remote technology for automated meter reading. Upon the approval of this proposal, LENRD district staff will begin outreach to irrigators in the target areas and coordinate meter upgrades during the winter of 2023-'24 for implementation beginning in the Spring of 2024. Equipment will be deployed under this program through the end of 2025.

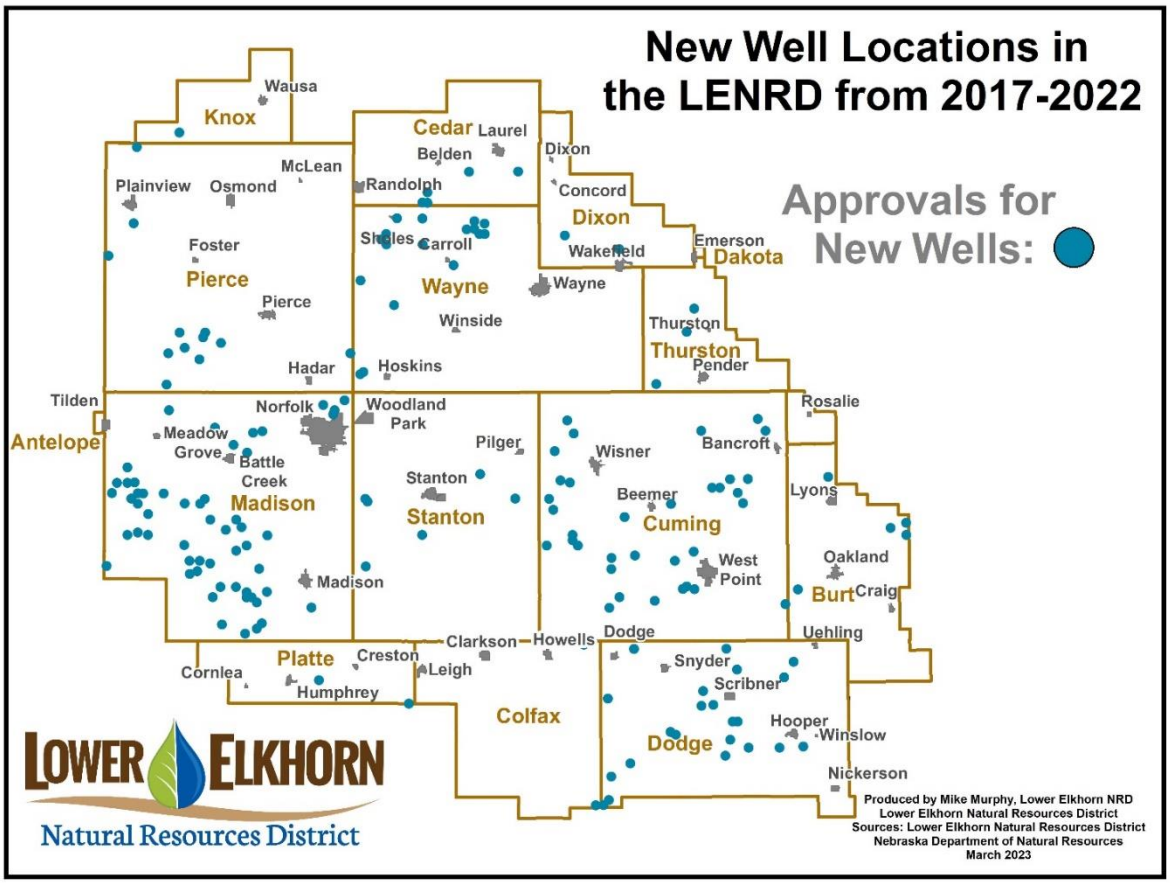
1.B.3 Describe field or research investigations utilized to substantiate the project conception (004.02 B);

Each year the LENRD staff measure the static groundwater levels in 240 irrigation wells across the district. In the spring of 2022, the wells decreased an average of 1.09' across the district - 20 wells increased at least 0.2' (8.3%), 189 wells decreased at least 0.2' (78.8%), and 31 wells remained unchanged, +/-0.2' (12.9%). Long-term monitoring of water levels are done to obtain long-term data, and used criteria for groundwater quantity triggers located in rule 12 of the district's groundwater management rules and regulations. In 2020-2021 the wells across the district decreased an average of 2.42'. From the spring of 2021-2022, the wells decreased an average of 1.09'. Generally, wells had increased since 2013, until the last 2 years. Well water levels can be highly variable depending on depth of well, local weather conditions, hydrological connectivity, timing of rainfall, and regional aquifer conditions (confined/unconfined). LENRD staff are currently measuring the spring 2023 water levels. With the drought of 2022 still looming, continued declines are expected upon the conclusion of Spring 2023 groundwater level measurements.

Cellular Coverage in LENRD



The map above represents cellular coverage for a major carrier in the country and the Midwest in the general area of LENRD. This demonstrates 4G coverage uniformly across the LENRD supporting cellular communications planned for this project.



1.B.4 Describe any necessary water and/or land rights (004.02 C); **NA**

1.B.5 Discuss the anticipated effects, if any, of the project upon the development and/or operation of existing or envisioned structural measures including a brief description of any such measure (004.02 D).

The water managers and farmers in the LENRD realize that if groundwater declines continue, wells may decline in production to the point where allocations will need to be reduced causing farmers to switch to different crops or farm fewer acres both of which will reduce yields and income streams to local farmers and negatively affect the local economy. This project will support the sustainable use of groundwater in the district to maintain beneficial uses for agriculture, domestic, municipal, and industrial uses.

The proposed practices will be beneficial to groundwater quality since irrigation water management will become more efficient because of this project. Near real-time water use data will have the effect of improving the seasonal application efficiency of irrigation water having the effect of limiting or reducing the leaching of nitrogen fertilizers or other agricultural chemicals out of the plant root zone into the local aquifer where it can be intercepted by drinking water wells.

Prove Economic Feasibility

(Applicant must demonstrate compliance with Title 261, CH 2 - 005)

2. Provide evidence that there are no known means of accomplishing the same purpose or purposes more economically, by describing the next best alternative.

Alternatives would include sending a technician traveling to the site regularly – possibly weekly or monthly which would provide lower quality data to the famer for irrigation management. This would be largely inefficient requiring the hiring of additional staff, thousands of miles driven yearly causing extensive wear and tear to district vehicles and would still not supply near real-time data to farmers for irrigation water management decisions.

Radio systems can provide data with lower data transmission costs but would require much higher capital outplay for repeater towers as well as radio receivers and local servers to maintain. A radio network that would cover even a small portion of LENRD would cost at least $1,000,000 not including land acquisition, design, or integration costs to the district's computer system. A system that would cover the entire district would cost tens of millions of dollars once land acquisition, structural costs, and hardware/software integration are included.

3. Document all sources and report all **costs** and **benefit data** using current data, (commodity prices, recreation benefit prices, and wildlife prices as prescribed by the Director) using both dollar values and other units of measurement when appropriate (environmental, social, cultural, data improvement, etc.). The period of analysis for economic feasibility studies is the project life. (Title 261, CH 2 - 005).

Budget Item Description	Computation $/unit	Quantity	Quantity Type (hours/days)	Total Cost
Equipment				
Flow Meter Telemetry Upgrades	$1,957.00	90	ea	$176,130
Subtotal				**$176,130**
Supplies and Materials				
Meter Accessories/Supplies	$ 150.00	90		$13,500
Blank Cover Plates	$ 122.00	20		$2,440
Subtotal				**$15,940**
Contractual/Construction				
*Flow Meter Retrieval/Telemetry Installation	$50.00	900	hours	$45,000
*Program Administration	$50.00	450	hours	$22,500
Data Acquisition/Processing	$250.00	45	1st yr	$11,250
Data Acquisition/Processing	$250.00	45	2nd yr	$11,250
				$90,000
				$282,070

The project cost estimate is **$282,070**. This includes $176,130 to perform flow meter upgrades to add telemetry, $15,940 for supplies and materials, $45,000 for in-kind staff time for retrieval and installation of meters in the field to perform telemetry upgrades, $22,500 for in-kind staff time program administration and $22,500 for cellular data acquisition and processing. The cost basis for the remote telemetry equipment upgrades and cellular data acquisition have been obtained from McCrometer, the manufacturer of the predominant meter model in the district. Material costs have been estimated from possible needs for conduit, enclosures, masts, pipe hole covers, or other items needed to implement the project. In-kind staff time has been estimated at 900 hours for field staff time to retrieve and reinstall meters to perform upgrades and 450 hours for program administration. $50/hour was the value placed on in-kind staff time.

3.A Describe any relevant cost information including, but not limited to the engineering and inspection costs, capital construction costs, annual operation and maintenance costs, and replacement costs. Cost information shall also include the estimated construction period as well as the estimated project life (005.01).

This project will have no engineering, inspection, or construction costs. The only maintenance costs will be the replacement of batteries for the remote telemetry equipment at a cost of $109/unit every three years. Additionally, a digital meter register will need a new battery every 7 - 8 years at a cost of $51/meter. Maintenance on flow meters should be minimal since meters will have just gone to a Certified Service Provider to perform the telemetry upgrades. The projected life is expected to be 15-20 years for the equipment that will be installed.

3.B Only primary tangible benefits may be counted in providing the monetary benefit information and shall be displayed by year for the project life. In a multi-purpose project, estimate benefits for each purpose, by year, for the life of the project. Describe intangible or secondary benefits (if any) separately. In a case where there is no generally accepted method for calculation of primary tangible benefits describe how the project will increase water sustainability, in a way that justifies economic feasibility of the project such that the finding can be approved by the Director and the Commission (005.02).

The primary tangible benefit is a challenge to define. Proper long-term management of groundwater ensures that future uses of the resource can occur sustainably and allow current and future users beneficial use of groundwater that is safe and plentiful. Nebraska's reliance on water grows annually. In a state as reliant on groundwater as Nebraska a sustainable water supply is a necessity. Nebraska's reliance on water grows yearly. This is significant since agriculture is the largest user of groundwater in LENRD.

This project will support the sustainability of groundwater resources for all uses including agriculture, domestic, municipal and industrial in the LENRD.

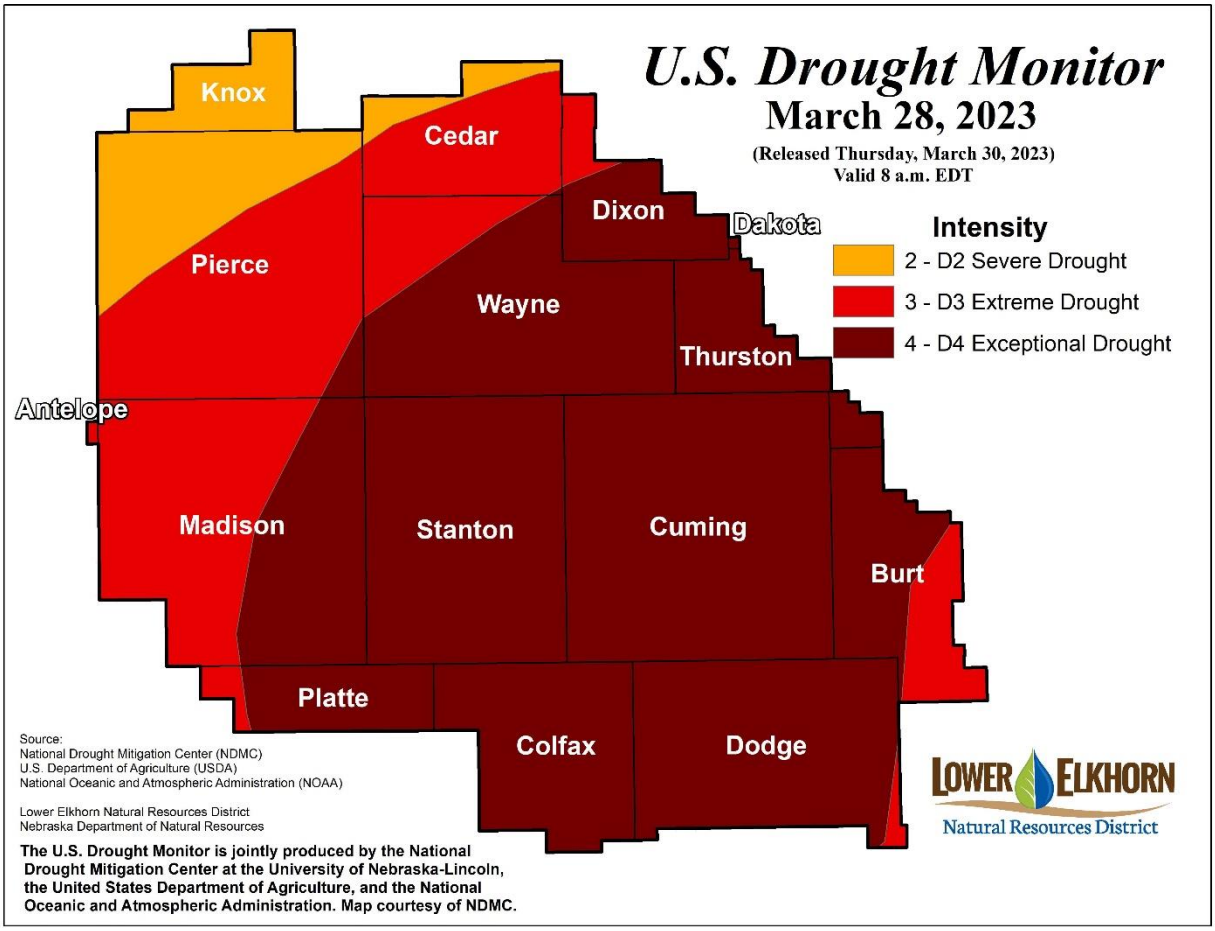
3.C Present all cost and benefit data in a table to indicate the annual cash flow for the life of the project (005.03).

Funding Sources	Yr1	Yr2	Total
Lower Elkhorn NRD (LENRD)	$ 56,414.00	$ 56,414.00	$ 112,828.00
Nebraska DNR (NDNR)	$ 84,621.00	$ 84,621.00	$ 169,242.00
Totals			$ 282,070.00

The total project costs of $282,070 will be split between the LENRD and the NDNR at a 40/60 match of $112,828 from the LENRD in the form of cash and in-kind funds, while the remaining 60% will come from the NDNR in the amount of $169,242. These costs are expected to be distributed evenly across the two years of the proposed project.

3.D In the case of projects for which there is no generally accepted method for calculation of primary tangible benefits and if the project will increase water sustainability, demonstrate the economic feasibility of such proposal by such method as the Director and the Commission deem appropriate (005.04). (For example, show costs of and describe the next best alternative.)

Economic benefits of this program are difficult to calculate since this program will essentially support sustainability of groundwater resources in the LENRD. LENRD has experienced levels of drought classified as Extreme to Exceptional by the U.S. Drought Monitor in recent years.



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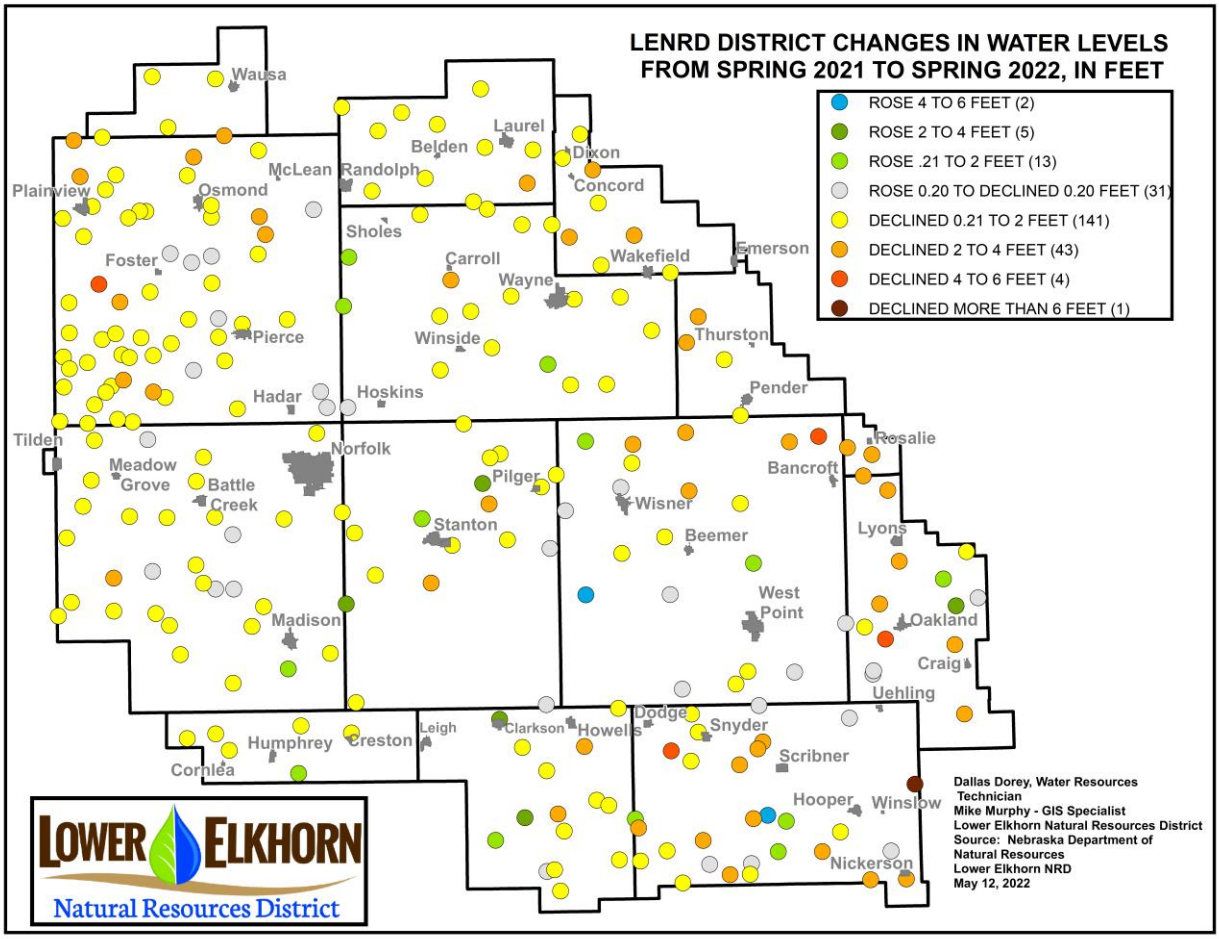
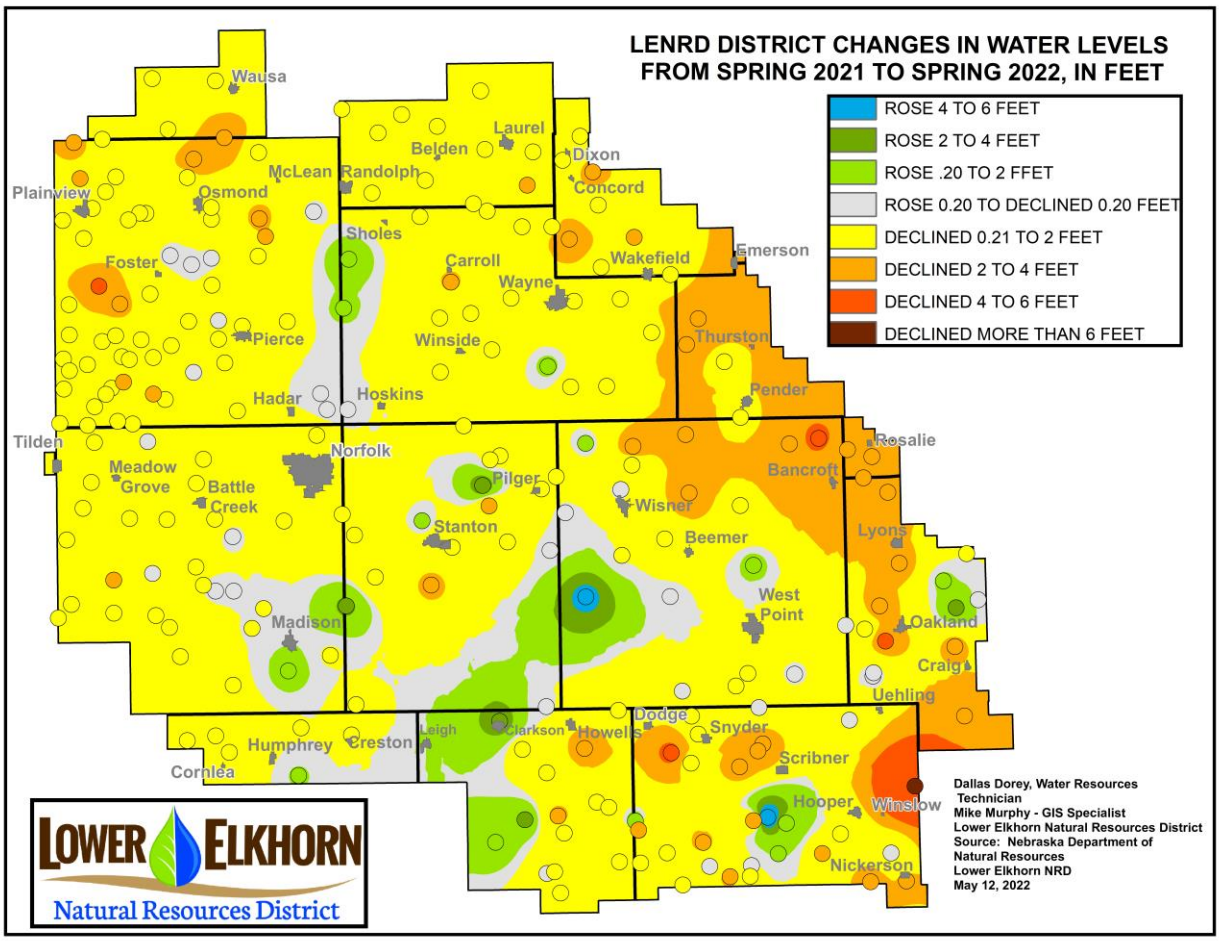

LENRD DISTRICT CHANGES IN WATER LEVELS
FROM SPRING 2021 TO SPRING 2022, IN FEET
ROSE 4 TO 6 FEET (2)
ROSE 2 TO 4 FEET (5)
ROSE .21 TO 2 FEET (13)
ROSE 0.20 TO DECLINED 0.20 FEET (31)
DECLINED 0.21 TO 2 FEET (141)
DECLINED 2 TO 4 FEET (43)
DECLINED 4 TO 6 FEET (4)
DECLINED MORE THAN 6 FEET (1)
Wausa
Laurel
Belden
Dixon
Concord
McLean
Randolph
Plainview
Osmond
Sholes
Foster
Carroll
Wakefield
Emerson
Wayne
Pierce
Winside
Thurston
Hadar
Hoskins
Pender
Tilden
Norfolk
Rosalie
Meadow Grove
Battle Creek
Pilger
Bancroft
Wisner
Stanton
Beemer
Lyons
West Point
Madison
Oakland
Craig
Uehling
Dodge
Leigh
Clarkson
Howells
Snyder
Humphrey
Creston
Cornlea
Scribner
Hooper
Winslow
Nickerson
LOWER ELKHORN
Natural Resources District
Dallas Dorey, Water Resources Technician
Mike Murphy - GIS Specialist
Lower Elkhorn Natural Resources District
Source: Nebraska Department of Natural Resources
Lower Elkhorn NRD
May 12, 2022



The practices implemented in this proposal will support the sustainability of irrigated agriculture in LENRD as well as other areas of the state experiencing drought conditions. Irrigated agriculture is significant in the LENRD with 5,668 active irrigation wells in the district irrigating 653,166 certified irrigated acres. Consequently, irrigated agriculture supports a significant portion of the local economy in the LENRD. This project will support the continued sustainability of groundwater resources in the LENRD.

Prove Financial Feasibility

(Applicant must demonstrate compliance with Title 261, CH 2 - 006)

4. Provide evidence that sufficient funds are available to complete the proposal.

LENRD has budgeted funds to cover the 40% contribution to the project. These funds will be used as necessary and be available for the duration of the grant.

5. Provide evidence that sufficient annual revenue is available to repay the reimbursable costs and to cover OM&R (operate, maintain, and replace).

LENRD's budget comes from a mill levy assessed to property values. The budget is set on a yearly basis and has remained steady for several years. A portion of the budget has been allocated to ensure there is sufficient funding to cover the LENRD's 40% match for this project.

The LENRD's operating budget for Fiscal Year 2023 was approved by the Board of Directors at their September meeting with a tax request of $4,522,473. The estimated levy, based on the property tax request, is 2.2968 cents per $100 of valuation, which is a decrease of 1.15% from the fiscal year 2022 levy of 2.3236 cents per $100 of valuation.

6. If a loan is involved, provide sufficient documentation to prove that the loan can be repaid during the repayment life of the proposal. NA

7. Describe how the plan of development minimizes impacts on the natural environment (i.e. timing vs nesting/migration, etc.).

The project will have minimal impact on the existing landscape since remote monitoring equipment will be added to existing irrigation flow meters within LENRD. The existing landscape will not be altered from current agricultural use. No new disruptions to flora or fauna will be created by the project.

8. Explain how you are qualified, responsible, and legally capable of carrying out the project for which you are seeking funds.

In 1972, the Nebraska Legislature created and declared that NRDs are essential to the health and welfare of the people and the State of Nebraska. NRDs were tasked by the legislature to conserve, protect, develop, and manage the state's natural resources. LENRD employs a professional staff upon whose shoulders this responsibility falls. LENRD staff are trained and well qualified in these assistance programs as outlined in the grant application. LENRD staff have experience with all the project areas proposed and are fully capable of executing the vision of our locally elected Board of Directors. Staff have the expertise to assist producers, install and maintain equipment, and both analyze and utilize any data collected during the project

9. Explain how your project considers plans and programs of the state and resources development plans of the political subdivisions of the state.

The Lower Elkhorn Natural Resources District (LENRD) is a member of the Lower Platte River Basin Coalition, which includes seven NRD's and the Nebraska Department of Natural Resources. This coalition was formed to initiate the process of developing a basin plan, which includes an inventory of current water uses (both groundwater and surface water) and projects the amount of available depletions (by sub-basin and NRD) allowable for the term of the accounting period. In 2017, the LENRD adopted Conditions for Approval that would be imposed on any new irrigation well constructed within the district. The conditions include an annual groundwater allocation of 9

inches/acre for irrigation of a primary crop, and an additional 2 inches/acre to be used post-harvest for establishing a conservation cover crop. The logic behind this policy is to allow for the addition of new uses of groundwater for irrigation purposes, while providing protection for existing groundwater users. This concept will also provide protection for hydrologically connected rivers and streams, since it would effectively "cap" the amount of groundwater withdrawal; a portion of which would otherwise reach the connected river or stream. If funded, this project would target the new wells constructed since 2017 as a means of providing enhanced ability to monitor pumping for both the well owner and the district.

10. Are land rights necessary to complete your project? YES☐ NO☒

If yes:

10.A Provide a complete listing of all lands involved in the project.

10.B Attach proof of ownership for each easement, rights-of-way and fee title currently held.

10.C Provide assurance that you can hold or can acquire title to all lands not currently held.

11. Identify how you possess all necessary authority to undertake or participate in the project.

On July 1st, 1972, the Nebraska Legislature created the Natural Resources Districts pursuant to Chapter 2, Article 32, 2-3201. The Legislature tasked NRDs with the management of groundwater and hydrologically connected groundwater and surface water. Chapter 46, Article 7, 46-702 of the Groundwater Management and Protection Act states, "The Legislature also finds that natural resources districts have the legal authority to regulate certain activities and, except as otherwise specifically provided by statute, as local entities are the preferred regulators of activities which may contribute to groundwater depletion."

12. Identify the probable consequences (environmental and ecological) that may result if the project is or is not completed.

The Drought of 2022 presented many challenges for all water users in the Lower Elkhorn NRD, but especially for those who use groundwater as a source of irrigation water. Subsequently, some well owners failed to monitor their irrigation water use with their flow meters and exceeded their annual groundwater allocation, established by the Board of Directors prior to the approval of their Standard Variance. The consequences of that lack of attention caused 32 well owners to be curtailed for the 2023 and 2024 pumping seasons. If those growers had access to enhanced means of monitoring their pumping, it's possible they might not have gotten themselves out of compliance. Funding of this proposal will allow the district to put some additional tools into the hands

of irrigators that will assist them in their decision-making, but most importantly will help them to maintain compliance and limit any undue negative impact to other groundwater and surface water users within their proximity. When these irrigators over pump and violate District regulations, they are causing an excess depletion of the aquifer. This may have the effect of excessive declines of the local aquifer causing impacts on neighboring wells as well as reduced streamflow from diminished spring discharge.

Section C.

NRC SCORING

In the NRC's scoring process, points will be given to each project in ranking the projects, with the total number of points determining the final project ranking list.

The following 15 criteria constitute the items for which points will be assigned. Point assignments will be 0, 2, 4, or 6 for items 1 through 8; and 0, 1, 2, or 3 for items 9 through 15. Two additional points will be awarded to projects which address issues determined by the NRC to be the result of a federal mandate.

Notes:

- The responses to one criterion *will not* be considered in the scoring of other criteria. Repeat references as needed to support documentation in each criterion as appropriate. The 15 categories are specified by statute and will be used to create scoring matrixes which will ultimately determine which projects receive funding.

- There is a total of 69 possible points, plus two bonus points. The potential number of points awarded for each criteria are noted above. Once points are assigned, they will be added to determine a final score. The scores will determine ranking.

- The Commission recommends providing the requested information and the requests are not intended to limit the information an applicant may provide. An applicant should include additional information that is believed will assist the Commission in understanding a proposal so that it can be awarded the points to which it is entitled.

Complete any of the following (15) criteria which apply to your project. Your response will be reviewed and scored by the NRC. Place an N/A (not applicable) in any that do not apply, an N/A will automatically be placed in any response fields left blank.

1. Remediates or mitigates threats to drinking water;

    - Describe the specific threats to drinking water the project will address.
    - Identify whose drinking water, how many people are affected, how will project remediate or mitigate.
    - Provide a history of issues and tried solutions.
    - Provide detail regarding long-range impacts if issues are not resolved.

    The practices proposed by this project will support and protect the long-term sustainability of groundwater quality and quantity for drinking water for both individual domestic users as well as municipalities. Remote meter monitoring for irrigation water

management will have the benefit of reducing overall water pumped for irrigation uses in LENRD thereby retaining water in the local aquifer for future uses. This will limit the non-beneficial uses of groundwater in the district including runoff or off-site evapotranspiration by weeds or other phreatophytes that serve no beneficial purposes. Retaining water in the local aquifer is the optimal storage space for the conserved water resources since they will not be diminished by evaporation or non-beneficial transpiration.

The proposed practices will also be beneficial to drinking water quality since irrigation water management will become more efficient because of this project. Near real-time water use data will have the effect of improving the seasonal application efficiency of irrigation water having the effect of limiting or reducing the leaching of nitrogen fertilizers or other agricultural chemicals out of the plant root zone into the local aquifer where it can be intercepted by drinking water wells. This will be to the benefit of numerous municipalities in the LENRD as well as hundreds of private well owners.

2. Meets the goals and objectives of an approved integrated management plan or ground water management plan;

   - Identify the specific plan that is being referenced including date, who issued it and whether it is an IMP or GW management plan.
   - Provide the history of work completed to achieve the goals of this plan.
   - List which goals and objectives of the management plan the project provides benefits for and how the project provides those benefits.

This project will enhance the Lower Elkhorn Natural Resources District's (LENRD) ability to achieve the goals and objectives set forth in the district's Groundwater Management Plan, which was first approved by the Nebraska Department of Natural Resources in late 1984. This plan has undergone several revisions since that initial approval, the most recent occurring in January of 2018 to integrate a Drought Management component into the district's groundwater management strategy.

Groundwater Management Plan outlines the monitoring mechanisms that will be completed to evaluate the health and viability of aquifers in the district. The plan also identifies benchmarks, or triggers, that if met, provide a road-map for enhanced management schemes to sustain groundwater supplies well into the future. The district has been collecting groundwater elevation data from nearly 300 locations geographically dispersed throughout the district in both the spring and fall for decades. In addition, managed growth mechanisms were adopted in 2009 which limits the annual amount of new groundwater use for irrigation purposes. In 2017, an annual groundwater allocation was adopted for any new well constructed under an approved Standard Variance. This limit was put in place to simultaneously allow for the construction of new irrigation wells while providing some level of protection for existing groundwater users. There are currently 179 locations within the Lower Elkhorn NRD

that have wells which are subject to these conditions, and this group of wells is the target for this project.

If funded, this project will benefit the goal of developing the groundwater resource to its fullest potential, while ensuring that the supply will be protected for future generations. As society expands its demand on the natural resources that sustain production of necessary food and fiber, so increases the need to expand our monitoring of their use. Equipping a portion of the targeted irrigation wells will allow both the well owner, and the Lower Elkhorn NRD, to monitor groundwater pumping in real time. This information can be utilized in conjunction with soil moisture monitoring and weather station data to enhance irrigation scheduling decisions.

3. Contributes to water sustainability goals by increasing aquifer recharge, reducing aquifer depletion, or increasing streamflow;

   List the following information that is applicable:

   - The location, area and amount of recharge;
   - The location, area and amount that aquifer depletion will be reduced;
   - The reach, amount and timing of increased streamflow. Describe how the project will meet these objectives and what the source of the water is;
   - Provide a detailed listing of cross basin benefits, if any.

This project contributes to water sustainability goals by reducing aquifer depletion. The Lower Elkhorn NRD has placed an annual allocation on new irrigation wells (wells constructed under approved expedited and standard variances). The annual groundwater allocation is 9 inches per certified acre for irrigation of the primary crop, plus an additional 2 inches per certified acre if the grower utilizes cover crops in their cropping system (it's to be utilized to germinate cover crop seed and establish vegetative growth for the cover crop). 179 wells in the Lower Elkhorn NRD are subject to this allocation, and these locations are the target areas for participation in this proposal.

Additional allocation subareas exist within the LENRD where these practices could be implemented in the future once the district has such a program in place and demonstrated success with reducing aquifer depletion through improved irrigation water management practices.

4. Contributes to multiple water supply goals, including, but not limited to, flood control, agricultural use, municipal and industrial uses, recreational benefits, wildlife habitat, conservation of water resources, and preservation of water resources;

   - List the goals the project provides benefits.
   - Describe how the project will provide these benefits

- Provide a long range forecast of the expected benefits this project could have versus continuing on current path.

The main benefit provided by this project is the use of near real-time water use data for improved irrigation water management. Water supply goals for agricultural water use will benefit by improving the ability for water users with allocations to improve seasonal irrigation efficiency by making better irrigation scheduling decisions and achieve compliance with LENRD rules and regulations. This compliance will ensure the furtherance of water supply goals for multiple water users in the LENRD.

Potentially water users of all types including agricultural, municipal, domestic and industrial will benefit from the water conserved under this project since the water that is saved will remain in the local aquifer for future uses. Water that remains in the aquifer is stored in the best possible location since the resource is protected from evaporation as well as transpiration by non-beneficial uses such as weeds or other phreatophytes that serve no beneficial purposes.

5. Maximizes the beneficial use of Nebraska's water resources for the benefit of the state's residents;

   - Describe how the project will maximize the increased beneficial use of Nebraska's water resources.
   - Describe the beneficial uses that will be reduced, if any.
   - Describe how the project provides a beneficial impact to the state's residents.

This project maximizes the beneficial use of Nebraska's water resources for irrigation. Sustainability of groundwater will be improved in LENRD by improving irrigation water use efficiency through limiting or reducing excessive or unnecessary pumping.

The only way that a beneficial use will be reduced is by reducing the pumping of irrigation water that is currently being pumped, but not needed. In this manner, the beneficial use of irrigation water is not being curtailed or restricted beyond the reasonable allocation established by LENRD. Instead, the beneficial use is becoming more efficient and sustainable where the resource is diminished.

This project will provide an example for other districts in the state with similar water shortage issues for effective water conservation practices that will benefit the waters of the state. Other NRDs in the state including MRNRD and CPNRD have implemented programs utilizing automated meter reading and have experienced reductions in irrigation water applications. This project is another example that will perpetuate this practice within the State of Nebraska and possilby others.

6. Is cost-effective;

   - List the estimated construction costs, O/M costs, land and water acquisition costs, alternative options, value of benefits gained.

- Compare these costs to other methods of achieving the same benefits.
- List the costs of the project.
- Describe how it is a cost effective project or alternative.

The battery-powered telemetry units that will be deployed under this program utilize cellular telemetry communications eliminating the need for commercial power sources to power the telemetry system. Since each system will be a cellular node, the communications system will be independent of a capital-intensive system of towers that would be necessary for a traditional radio telemetry system.

LENRD has communicated with other NRDs that employ several staff members that regularly read irrigation flow meters installed in the district that drive up to 50,000 miles/year in a three- month period. These districts that have installed telemetry for automated meter reading for irrigation flow meters have reduced the number of miles driven by approximately 50% and are accomplishing this with fewer technicians. The district projects that this technology, if widely adopted, could reduce miles driven by at least 75% for district employing conducting meter reading.

Other districts that have explored similar radio networks have discovered costs for such a system to radio towers that would cost approximately $70,000 per site (not including land costs) and communications equipment at the well to be nearly $4,000 per site. A radio network that would cover even a small portion of LENRD would cost at least $1,000,000 not including land acquisition, design, or integration costs to the district's computer system.

Achieving the goals of this project would not be possible without the deployment of real-time telemetry. The technology proposed would provide daily readings to farmers within allocation areas of LENRD for improved water management which would be technically and economically impossible compared to driving to the site for physical readings.

Approval of this proposal will prevent thousands of miles driven and in turn the production of greenhouse gases by LENRD employees in the future. In addition, the cellular technology proposed prevents the need for significant capital outlay by the district compared to similar radio-based networks.

The costs for this project are far more economical that other options proposed. Irrigation flow meters will be upgraded at an estimated cost of $1,957 which is less than half of other similar costs. Additional accessories or supplies (eg. conduit, masts, pipe hole covers, etc.) have been estimated at $15,940. In-kind staff time to perform field work for this project has been estimated at $45,000 for 900 hours. Project administration has been estimated at $22,500 for 450 hours. Finally, two years of data hosting and data acquisition services has been estimated at $22,500 for this project which is very economical for a decentralized remote telemetry project of this nature.

7. Helps the state meet its obligations under interstate compacts, decrees, or other state contracts or agreements or federal law;

- Identify the interstate compact, decree, state contract or agreement or federal law.
- Describe how the project will help the state meet its obligations under compacts, decrees, state contracts or agreements or federal law.
- Describe current deficiencies and document how the project will reduce deficiencies.

NA

8. Reduces threats to property damage or protects critical infrastructure that consists of the physical assets, systems, and networks vital to the state or the United States such that their incapacitation would have a debilitating effect on public security or public health and safety;

- Identify the property that the project is intended to reduce threats to.
- Describe and quantify reductions in threats to critical infrastructure provided by the project and how the infrastructure is vital to Nebraska or the United States.
- Identify the potential value of cost savings resulting from completion of the project.
- Describe the benefits for public security, public health and safety.

Several types of property damage can be prevented through the implementation of this project. When significant groundwater declines occur, subsidence can also occur which constricts the available storage in the local aquifer, has the potential to damage critical infrastructure such as buildings, roads, and even the irrigation system itself.

Quite often when groundwater tables decline, well owners may be required to drill deeper wells at significant additional cost. This also can lower the water table in the local aquifer below the screens of existing wells that may be the source for domestic, municipal, industrial, or other irrigation wells having significant effects on critical water supply infrastructure for these various uses. Putting a value on the savings from replacing these wells is difficult since the cost of replacing a domestic well could be tens of thousands of dollars while replacing a larger municipal, industrial, or irrigation well could be hundreds of thousands of dollars. Several of these sources of water would be beneficial to public health, safety, and security.

9. Improves water quality;

- Describe what quality issue(s) is/are to be improved.
- Describe and quantify how the project improves water quality, what is the target area, what is the population or acreage receiving benefits, what is the usage of the water: residential, industrial, agriculture or recreational.
- Describe other possible solutions to remedy this issue.

- Describe the history of the water quality issue including previous attempts to remedy the problem and the results obtained.

LENRD does have areas where concentrations of high nitrates exist in the local aquifer. These groundwater nitrate concentrations are well-documented in the Bazile Groundwater Management Area (BGMA), a federally-recognized groundwater quality area. Previous demonstrations of other practices have not significantly reduced groundwater nitrate concentrations. This project may introduce practices that will have benefits of improving groundwater quality.

The proposed practices will be beneficial to groundwater quality since irrigation water management will become more efficient because of this project. Near real-time water use data will have the effect of improving the seasonal application efficiency of irrigation water having the effect of limiting or reducing the leaching of nitrogen fertilizers or other agricultural chemicals out of the plant root zone into the local aquifer where it can be intercepted by drinking water wells.

The population within LENRD that will benefit as a result of this proposal is the group of irrigators that hold the 179 permits for newer wells within the district that have a 9-inch allocation or an additional 2 inches if they utilize cover crops. Once groundwater conservation is experienced on these acres, the practice will likely be transferred to other areas of the district with groundwater depletion concerns.

10. Has utilized all available funding resources of the local jurisdiction to support the program, project, or activity;

    - Identify the local jurisdiction that supports the project.
    - List current property tax levy, valuations, or other sources of revenue for the sponsoring entity.
    - List other funding sources for the project.

The project is supported by the Lower Elkhorn Natural Resources District (LENRD).

The operating budget for Fiscal Year 2023 was approved by the LENRD Board of Directors with a tax request of $4,522,473. The levy, based on the property tax request, is 2.2968 cents per $100 of valuation, which is a decrease of 1.15% from the fiscal year 2022 levy of 2.3236 cents per $100 of valuation.

For example, if a person owns a $300,000 house, the taxes owed to the LENRD would have been $69.70 in 2022 and will be approximately $68.90 in 2023. With major grant funding approved for the district, the LENRD's total operating budget for fiscal year 2023 was near $13.8 million, with only $4.5 million in revenue from the property tax levy.

If funded, the project will be supported by funding from the Nebraska Department of Natural Resources Water Sustainability Fund and the general revenues of the Lower Elkhorn NRD. No other sources of revenue are currently proposed for this project. LENRD will budget funds sufficient to cover 40% of the cost of this project to match funding from the State of Nebraska.

11. Has a local jurisdiction with plans in place that support sustainable water use;

- List the local jurisdiction and identify specific plans being referenced that are in place to support sustainable water use.
- Provide the history of work completed to achieve the goals of these plans.
- List which goals and objectives this project will provide benefits for and how this project supports or contributes to those plans.
- Describe and quantify how the project supports sustainable water use, what is the target area, what is the population or acreage receiving benefits, what is the usage of the water: residential, industrial, agriculture or recreational.
- List all stakeholders involved in project.
- Identify who benefits from this project.

The local jurisdiction is the Lower Elkhorn Natural Resources District (LENRD) which has a Groundwater Management Plan, and an Integrated Management Plan, in place to govern water use in the district.

The LENRD has engaged in efforts to monitor groundwater quantity and quality for decades, and activities include: annual static water level monitoring, irrigation and monitoring well network water sampling, periodic revisions to the Groundwater Management Plan and Rules and Regulations to integrate new management mechanisms as conditions require, development and adoption of mechanisms to facilitate the expansion of groundwater uses for beneficial purposes, while providing mechanisms to guarantee the protection of existing users.

As previously stated, the district supports the development of available groundwater supplies to their fullest potential and this project would provide real time information that can be utilized for enhanced monitoring of irrigation pumping for protection of the resource, and to help well owners maintain compliance with district requirements. This proposal is targeted to irrigation wells in the LENRD that have been permitted for construction since 2017 and have conditions for use attached which limits the annual amount of groundwater withdrawals. These wells are geographically dispersed across the entire district, and in total will irrigate approximately 25,000 acres.

Stakeholders with a direct involvement include 179 private property owners, the McCrometer Company, and the LENRD. Stakeholders with indirect involvement include all other residents and property owners who depend on groundwater to sustain their health and welfare. Direct benefactors of this project will include the private property

owners, who will have access to real time water use information, and the LENRD, who will have an efficient means of accessing water use information that can be used to assist well owners in maintaining compliance with district requirements. These landowners have provided feedback to LENRD staff that this technology will be beneficial to their water management practices.

12. Addresses a statewide problem or issue;

- List the issues or problems addressed by the project and why they should be considered statewide.
- Describe how the project will address each issue and/or problem.
- Describe the total number of people and/or total number of acres that would receive benefits.
- Identify the benefit, to the state, this project would provide.

Advantages of remote meter monitoring are documented and well-known, however not widely used in the State of Nebraska. This project will further the practice of remote meter monitoring for water conservation by improving irrigation water management through the data acquisition of near real-time water use application which will aid the farmer not only in meeting allocation requirements, but also in conserving water. Up to 90 individuals will benefit from this project and influence an estimated 11,000 acres.

This project will have the ability to be replicated in any other portion of Nebraska or other state where declines in groundwater have caused NRDs or other conservation agencies to manage groundwater depletions through the implementation of water allocations.

The Central Platte NRD in Grand Island, NE just completed a 10-year groundwater pumping study which utilized remote meter monitoring. Results showed that several producers utilized real-time data to impact irrigation decisions, particularly to decrease water usage. In this study, historical irrigation habits were maintained during the first two years, but by the third year, irrigation behavior changed markedly from an average of 25 inches per acre to an average of less than 10 inches per acre. LENRD hopes to achieve similar results with this program.

13. Contributes to the state's ability to leverage state dollars with local or federal government partners or other partners to maximize the use of its resources;

- List other funding sources or other partners, and the amount each will contribute, in a funding matrix.
- Describe how each source of funding is made available if the project is funded.
- Provide a copy or evidence of each commitment, for each separate source, of match dollars and funding partners.
- Describe how you will proceed if other funding sources do not come through.

LENRD will budget funds sufficient to cover 40% of the cost of this project to match funding from the State of Nebraska. LENRD obtains funding from a mill levy on property within the district. LENRD also intends to apply for federal funding most likely from the Bureau of Reclamation to further leverage state funds and expand these conservation activities in the district.

14. Contributes to watershed health and function;

- Describe how the project will contribute to watershed health and function in detail and list all of the watersheds affected.

Nothing is more important to the health and function of a watershed than an adequate water supply for wildlife, people, and plants for the natural landscape and food production. This project will implement water saving practices for agriculture that will support groundwater sustainability for all uses. Agriculture is the primary user of groundwater resources in the district and will consequently have the greatest impact on watershed health. These practices will be available throughout the Lower Elkhorn watershed where recent well permits were given an allocation.

15. Uses objectives described in the annual report and plan of work for the state water planning and review process issued by the department.

- Identify the date of the Annual Report utilized.
- List any and all objectives of the Annual Report intended to be met by the project
- Explain how the project meets each objective.

The development of this irrigation management program to upgrade remote telemetry equipment on flow meters serves is an opportunistic project for the NeDNR to collaborate with the LENRD and meets several of the goals identified by NeDNR to implement Neb. Rev. Stat. 2-1599 described below:

1. Maintain data, information, and analysis capabilities for water planning, including specific programs for collecting, maintaining, and distributing information on streamflows, as well as analyzing water uses and water supplies across the state;

This project clearly meets Objective 1 by developing the necessary tools to acquire water use data for irrigation management on the farm level as well as the watershed level. Additionally, the NeDNR will directly benefit as a collaborator with the LENRD when collecting and analyzing water use data and supplies across the district.

2. Provide staff and resources to support planning and implementation of water resources projects;

LENRD will partner to this project with the financial assistance of the NeDNR and has allocated staff to provide resources and support implementation of the project.

3. Support locally developed water management plans for managing hydrologically connected water supplies;

his project supports the basis for scientifically based decisions for irrigation water management which is in direct alignment with implementation of the LENRD Voluntary IMP.

4. Provide coordination of federal agencies, state agencies, local NRDs, and other water interests for the development of water resources programs and projects.

LENRD intends to utilize funding from the NeDNR to initiate this program in priority areas of the district and then expand upon this by leveraging federal funds with district and state dollars to support groundwater management in the LENRD.

5. Participate in interagency collaboration with federal agencies, state agencies, local natural resources districts (NRDs), and other water interest entities on various water resources programs and projects; and

This project is a joint venture between the LENRD and NeDNR which will also include the cooperation of private industry to implement technology. As this program evolves, the Bureau of Reclamation will likely be involved to provide funding through the Water SMART program as well.

6. Consolidate and present information in a form that is understandable and useful to the public and interagency collaborators.

This project will generate water use data in a useable digital format that will be readily available for irrigators for water management decisions as well as district water managers for basin-wide water management and reporting. Real-time data is used widely for weather, health, and transportation applications. This project will make advance the technology to make it available for water management as well.

16. Federal Mandate Bonus. If you believe that your project is designed to meet the requirements of a federal mandate which furthers the goals of the WSF, then:

- Describe the federal mandate.
- Provide documentary evidence of the federal mandate.
- Describe how the project meets the requirements of the federal mandate.
- Describe the relationship between the federal mandate and how the project furthers the goals of water sustainability.

Elevated groundwater nitrate concentrations are well-documented in the Bazile Groundwater Management Area (BGMA), a federally-recognized groundwater quality area. The BGMA was originally identified as the Bazile Triangle area of concern in the late 1980s because of nitrate contamination affecting municipal wells in the vicinity of the Villages of Brunswick, Creighton, Orchard, Osmond, Plainview, Royal, and Wausa, Nebraska. This was later expanded to the current BGMA, which covers 21 townships, or 756 square miles. Two thirds of the total land use, or about 324,000 acres, is used for row crop production. While no federal mandates currently exist for this federally-recognized groundwater quality area, this proposed project has the potential to be implemented by irrigators in the BGMA and present a possible solution to nitrate concerns in the BGMA.