NEBRASKA NATURAL RESOURCES COMMISSION

Water Sustainability Fund

Application for Funding

Section A.

ADMINISTRATIVE

PROJECT NAME: Upper Republican NRD Groundwater Modeling Project

PRIMARY CONTACT INFORMATION

Entity Name: Upper Republican Natural Resources District

Contact Name: Nate Jenkins

Address: PO Box 1140, Imperial, NE 69033

Phone: 308-882-5173

Email: natejenkins@urnrd.org

Partners / Co-sponsors, if any: N/A

1. Dollar amounts requested: Grant, $243,000

   Grant amount requested. $ $243,000

   Loan amount requested. $ N/A

   If Loan, how many years repayment period? N/A

   If Loan, supply a complete year-by-year repayment schedule.
   N/A

2. Permits Needed - Attach copy for each obtained (N/A = not applicable)

Nebraska Game & Parks Commission (G&P) consultation on Threatened and Endangered Species and their Habitat	N/A☒	Obtained: YES☐ NO☐
Surface Water Right	N/A☒	Obtained: YES☐ NO☐

USACE (e.g., 404 Permit)	N/A☒	Obtained: YES☐	NO☐
Cultural Resources Evaluation	N/A☒	Obtained: YES☐	NO☐
Other (provide explanation below) Click here to enter text.	N/A☒	Obtained: YES☐	NO☐

3. Are you applying for funding for a combined sewer over-flow 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☒

   If yes attach a copy to your application. N/A

   If yes what is the population served by your project? N/A

   If yes provide a demonstration of need. N/A

   If yes and you were approved for funding in the most recent funding cycle, then resubmit the above information updated annually but you need not complete the remainder of the application.

4. If you are or are representing an NRD, do you have an Integrated Management Plan in place, or have you initiated one?

   N/A☐ YES☒ NO☐

5. Has this application previously been submitted for funding assistance from the Water Sustainability Fund and not been funded?

   YES☐ NO☒

   If yes, have any changes been made to the application in comparison to the previously submitted application? N/A

   If yes, describe the changes that have been made since the last application. N/A

   No, I certify the application is a true and exact copy of the previously submitted and scored application. (Signature required) N/A

6. Complete the following if your project has or will commence prior to next July 1st.

As of the date of submittal of this application, what is the Total Net Local Share of Expenses incurred for which you are asking cost share assistance from this fund? $ N/A

Attach all substantiating documentation such as invoices, cancelled checks etc. along with an itemized statement for these expenses. N/A

Estimate the Total Net Local Share of Expenses and a description of each you will incur between the date of submittal of this application and next July 1st for which you are asking cost share assistance from this fund.
$ N/A

Section B.

DNR DIRECTOR'S FINDINGS

Does your project include physical construction (defined as moving dirt, directing water, physically constructing something, or installing equipment)?

YES☐ NO☒

1(a). If yes (structural), submit a feasibility report (to comply with Title 261, CH 2) including engineering and technical data and the following information:

A discussion of the plan of development (004.01 A);
N/A

A description of all field investigations made to substantiate the feasibility report (004.01 B); N/A

Maps, drawings, charts, tables, etc., used as a basis for the feasibility report (004.01 C); N/A

A description of any necessary water and land rights and pertinent water supply and water quality information, if appropriate (004.01 D);
N/A

A discussion of each component of the final plan including, when applicable (004.01 E); N/A

Required geologic investigation (004.01 E 1); N/A

Required hydrologic data (004.01 E 2); N/A

Design criteria for final design including, but not limited to, soil mechanics, hydraulic, hydrologic, structural, embankments and foundation criteria (004.01 E 3). N/A

1(b). If no (non-structural), submit data necessary to establish technical feasibility including, but not limited to the following (004.02):

A discussion of the plan of development (004.02 A);

The primary water supply in the URNRD and the source of irrigated agriculture that is the foundation of the area's economy is the High Plains Aquifer. Rules and regulations imposed by the URNRD since the late 1970's, including what are believed to be the first limits on agricultural water use in the U.S., have successfully slowed declines in the aquifer. Variably declining water tables throughout the URNRD, however, persist

and further efforts to slow the rate of decline with the goal of eventually stabilizing water levels is the primary objective of the URNRD along with aiding State of Nebraska efforts to maintain compliance with the Republican River Compact.

To meet our primary goal of aquifer stabilization, it is essential that that we develop new modeling tools with the grant funds requested in this application. The main intended use of the model will be to predict the effects of different groundwater pumping scenarios on local aquifer behavior. The URNRD's use of an allocation system to limit water use gives it some control over pumping levels which will be modeled to project the impact that different allocations and regulatory schemes will have on aquifer levels and aquifer life throughout the District. Essentially, the model will help dictate URNRD regulatory decisions designed to ultimately meet the goal of aquifer stabilization.

In addition to regulatory decisions, the modeling will be used to engage URNRD constituents in discussions about long-term risks and benefits of different water-management decisions. This educational process is a priority for the URNRD, but it can only be pursued in a worthwhile manner once we are able to project short, mid and long-term water supplies. For instance, modeling will help us understand in more detail how many more years groundwater can be pumped at current rates before there is no longer enough water available to sufficiently irrigate crops. In several areas of the District, the usable lifespan of the aquifer for irrigation purposes under current pumping rates may be short enough to encourage constituents to support programs and regulations designed to prolong, ideally indefinitely, usable aquifer life. A robust and flexible groundwater model able to respond to the many, varying conditions throughout the District will then allow constituents to see the extents to which variable regulations and programs will extend aquifer life.

Data collected as part of the project will provide needed updates to our understanding of aquifer saturated thickness throughout the URNRD. The model will also be used to include quality aspects so that we can better predict the fate and movement of contaminants in the groundwater.

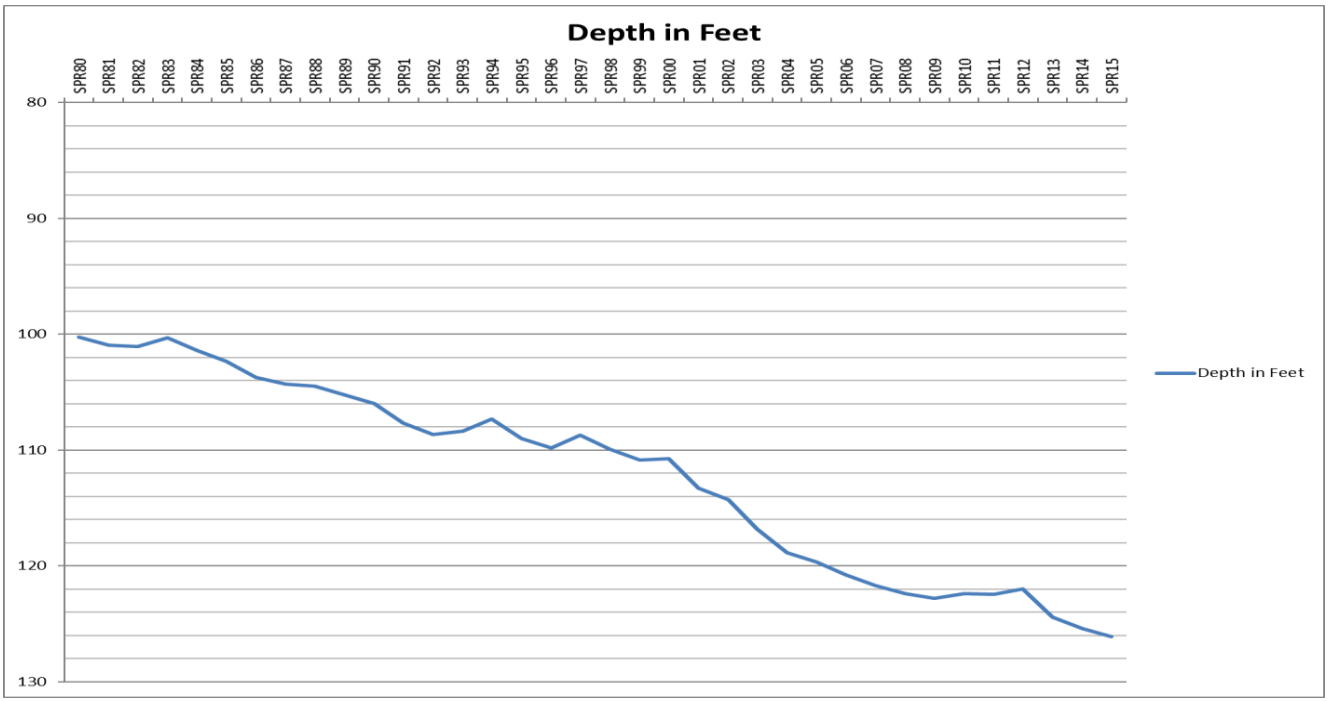
A description of field or research investigations utilized to substantiate the project conception (004.02 B);

District staff has twice annually measured groundwater levels since 1972 and since approximately 1980 has measured approximately 400 wells throughout the District. This data is actively managed to make District staff

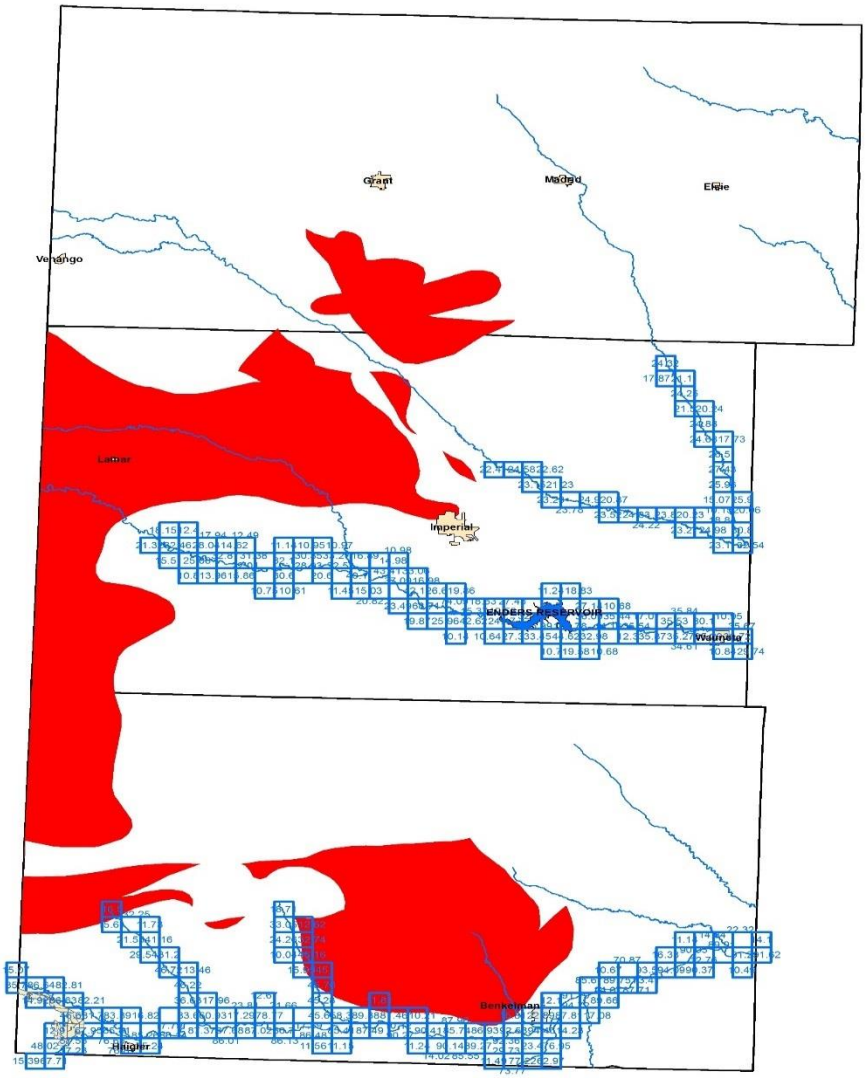
and constituents aware of water level changes throughout the District and is used to determine what changes are needed to the District's limitations on groundwater usage.

Groundwater level declines throughout the District from the period before widespread groundwater irrigation began in the 1960's until now have averaged approximately 25 feet, with the most significant declines being 60-70 feet. The average, annual decline in the water table throughout the District has been approximately .75 feet. Approximately 25% of the 1.7 million acres in the District are irrigated cropland.

The chart below utilizes spring groundwater level readings since 1980 to illustrate average depth-to-water in the District through spring 2015.

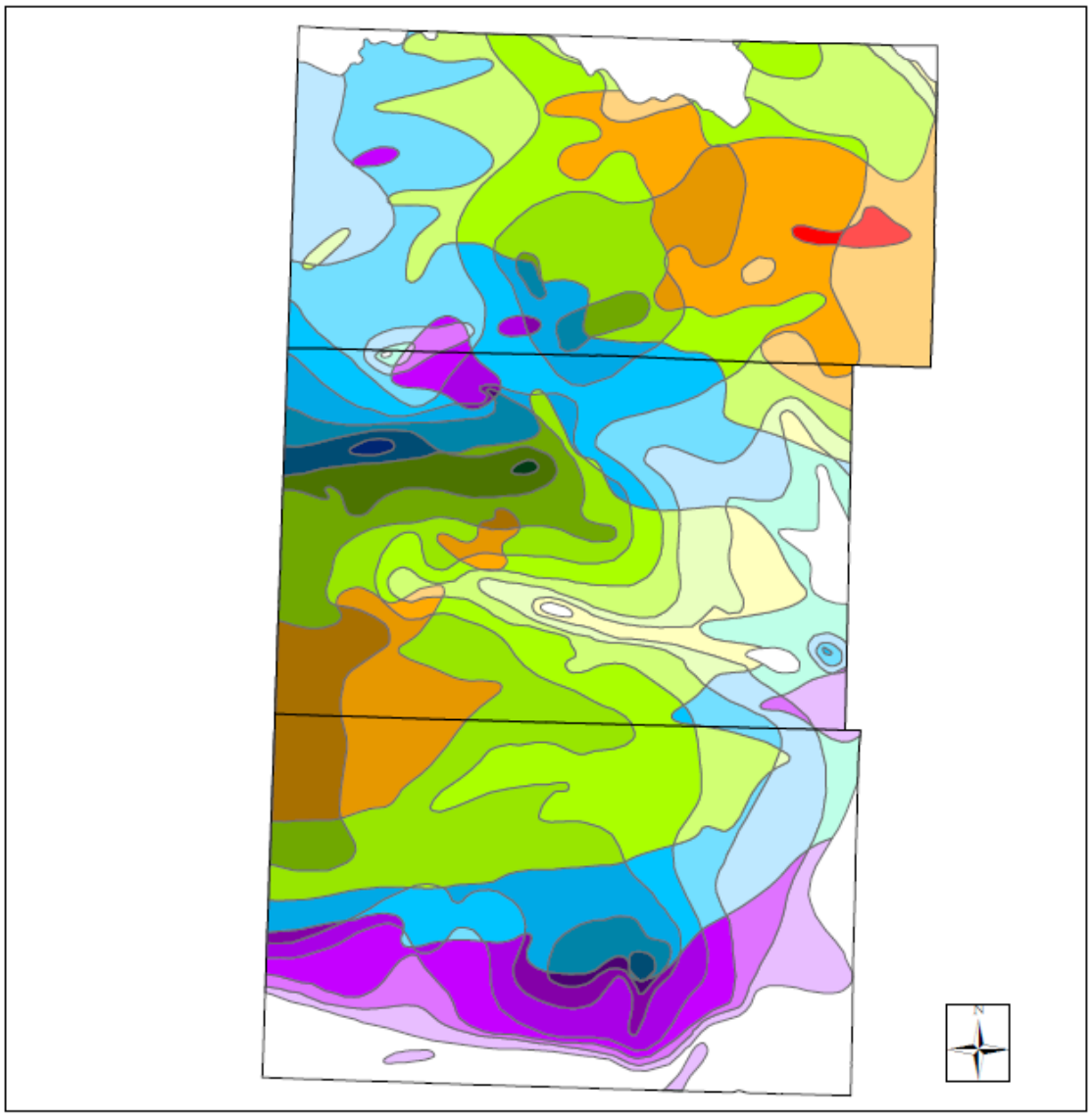


The map on the following page, produced for management purposes, shows areas within the District where at least 25% of the predevelopment saturated thickness of the aquifer has been depleted.



The next map illustrates declines in aquifer saturated thickness as a percentage of saturated thickness existing before irrigation development began.

URNRD Declines Relative To Saturated Thickness



<100ft SatThick % Decline Predev-09	100-200ft SatThick % Decline Predev-09	200-300ft SatThick % Decline Predev-09	300-400ft SatThick % Decline Predev-09	>400ft Sat Thick % Decline Predev-09
5-10 %	3.3-6.7%	2.5-5%	3.3-6.7%	5-7.5%
10-20 %	6.7-13.3%	5-10%	6.7-10%	7.5-10%
20-30%	13.3-20%	10-15%	10-13.3%	
30-40%	20-26.7%	15-20%	13.3-16.7%	
40-50%	26.7-33.3%	20-25%	16.7-20%	
50-60%	33.3-40%	25-30%		
60-70%	40-46.7%	30-35%		
	46.7%	>35%		

0 5 10 20 Miles

Information illustrated on the preceding maps is helpful but needs to be updated and refined with more current data that will be collected as part of the proposed project. Additionally, as one can see from the immediately preceding map of declines relative to saturated thickness, there is immense variability in aquifer thickness. This makes it very difficult to project with any degree of specificity how long usable quantities of water will exist in localized areas of the URNRD without developing a model able to respond to the variability with different inputs, namely irrigation withdrawals.

The Ogallala geologic formation underlies all but the extreme southern and northwestern parts of the URNRD. It ranges in thickness from a feathered edge to more than 400 feet. The Ogallala formation consists of beds of silt, sand, gravel, caliche and clay, with considerable variability in the character of the formation within short vertical or horizontal distances. These variations are consistent with the fluvial environment in which the Ogallala was deposited. Except in a few areas, most notable western Chase and Perkins Counties, the Ogallala formation is overlain by unconsolidated Quaternary deposits.

The unconsolidated Quaternary deposits, which comprise the land surface of most of the URNRD, consist of sand, gravel, silt, and clay. These deposits range in thickness from a feathered edge to more than 100 feet.

The aquifer within the URNRD is unconfined and the general direction of groundwater flow is west to east except in the vicinity of the Republican River. Average groundwater flow velocities range from less than 50 feet to more than 200 feet per year. The White River Group and the Pierre Shale are relatively impermeable and form the base of the aquifer. The volume of groundwater in storage bin the aquifer is a function of the saturated thickness, the area the aquifer covers, and the porosity of the aquifer. The typical specific-yield value, or recoverable, available water for the aquifer is in the range of 0.18. The saturated thickness ranges from 50 feet to 400 feet.

The parameters of the proposed model will be large, encompassing the entire aquifer underlying the District. It is expected the model will be developed using standard U.S. Geological Survey modeling software, MODFLOW, and a graphical user interface so it is accessible to support future uses of the model.

A description of the necessary water and/or land rights, if applicable (004.02 C); N/A

A discussion of 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 URNRD is researching potential opportunities to import excess South Platte River flows into the district. A few possible diversion points have been identified as worthy of consideration. The model proposed in this application could be useful in determining:

1. What areas of the District would benefit the most, and to what extent, from groundwater recharge produced by excess flow diversion.
2. Whether the volumes and availability of usable water produced by a diversion project would justify the costs.
3. Volumes and location of additional available groundwater from recharge when combined with regulatory and incentive programs designed to reduce groundwater pumping.

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

The intent of the project is to develop a groundwater model to produce information only currently available through use of such a model, e.g. projected aquifer behavior in response to different withdrawal rates. Because of this there are no other known means of accomplishing the same purpose more economically.

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 shall be fifty (50) years or with prior approval of the Director, up to one hundred (100) years [T261 CH 2 (005)].

- 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)

  Model Development

  The cost of developing the model and inputs to the model over a 30-month period will be approximately $210,000. This costs includes development of a work plan that will include at least two consultants to

ensure that the model contains all components necessary to achieve desired purposes. All sources of available data will be identified in the work plan, as well as sources of additional data that need to be developed for construction of, and inputs to, the model once completed. Desired uses of the model will also be identified in the work plan. The model is expected to be developed using MODFLOW modeling software.

Data Collection

The expected, approximate cost of the data collection component of the project is $105,000. Data collection over the 30-month period of the proposed project will include rates of groundwater withdrawals and saturated thickness in all areas of the District to establish boundaries of regions (zones) that have similar properties. The data will be essential to providing accurate inputs into the model and establishing zones for the purposes of educating groups of constituents with similar conditions relative to water supplies, and to aid the URNRD as we attempt to formulate different regulatory options for specific areas.

Analysis and Management Options

The expected cost of this component is approximately $90,000 and will cover analysis of model results to aid in development of water-management options for the URNRD. The water-management options are expected to include programs and/or regulations customized to address water-availability challenges identified in the water-management zones identified with aid from additional data collection. Costs will include analysis of aquifer reactions within the zones to varying pumping levels produced by programs/regulations, and the extent to which resulting aquifer behaviors will impact adjacent water-management zones.

- 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 any intangible or secondary benefits 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, such that the economic feasibility of the project can be approved by the Director and the Commission (005.02).

There is no generally accepted method for calculation of primary tangible benefits of the project but we believe it will increase water sustainability. This is primarily because the proposed project is not confined to groundwater modeling, but also includes analysis and

development of URNRD water-management options that are based on the modeling. Water sustainability means different things to different people, but was recently defined by a group in Nebraska solely tasked with creating a working definition as "Management…allowing the beneficial use of water, in an effective and efficient manner, to satisfy our socio-economic needs and obligations while minimizing the risk that water resources will be insufficient for future generations to meet their socio-economic needs and obligations" (2012, Republican River Basin Water Sustainability Task Force).

The purpose of the modeling and development of management options is to achieve the purposes contained within that definition, namely allowing reasonable use of water to continue while minimizing the risk that use risks availability of sufficient water in the future. The risk is minimized via the project by helping produce actions that reduce water use to the extents needed in different areas of the URNRD to ensure adequate water supplies in the future.

- All benefit and cost data shall be presented in a table form to indicate the annual cash flow for the life of the proposal, not to exceed 100 years (005.03).

  No generally acceptable method for calculation of primary tangible benefits exists for the project but table below is provided to illustrate annual activities and costs associated with the project.

Activity	Cost Year 1	Cost Year 2	Cost Year 3	Total
Modeling/Data Collection	$150,000	$150,000	$15,000	$315,000
Analysis and Management Options	$0	$30,000	$60,000	$90,000
Total By Year and Fund	**$150,000** (WSF $90,000 URNRD $60,000)	**$180,000** (WSF $108,000 URNRD $72,000)	**$75,000** (WSF $45,000 URNRD $30,000)	**$405,000** (WSF $243,000 URNRD $162,000)

- 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, the economic feasibility of such proposal shall be demonstrated by such method as the Director and the Commission deem appropriate (005.04). N/A

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

   The URNRD has a cash balance of approximately $8 million and has the ability to levy a $10/irrigated acre occupation tax that generates approximately $4.4 million annually. The property tax levy will generate approximately $2,035,000 in 2016-2017.

5. Provide evidence that sufficient annual revenue is available to repay the reimbursable costs and to cover OM&R (operate, maintain, and replace).
   N/A as there are no OM&R costs associated with the project

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

7. Describe how the plan of development minimizes impacts on the natural environment.

   Development of the project itself will have no impact on the natural environment; reduced water use caused by the project will have positive impacts on the natural environment.

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

   The URNRD's qualifications include 44 years of gathering data related to groundwater usage and levels and using the information to take management actions designed to preserve water, namely rules and regulations that limit water use. The proposed project is a natural progression of this work. The URNRD is responsible for executing the project because it correlates directly with groundwater management which is a primary statutory duty of the URNRD and other NRDs. Nebraska revised Statute 46-707 provides the URNRD and other NRDs the legal authority to collect water-related data and manage groundwater.

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

   The project is consistent with the URNRD's Groundwater Management Plan, Integrated Management Plan jointly developed with and approved by the State and duties associated with the Republican River Compact of which the State is party.

All of URNRD is a Groundwater Management Area where controls designed to reduce water consumption and extend aquifer life are in place. The project's intent and design to reduce water use are consistent with the State's interest in "management, protection and conservation of groundwater…that's essential to economic prosperity and future wellbeing of the State…and the public interest demands procedures for the implementation of management practices to conserve and protect groundwater supplies," (*Neb. Rev. Stat. 46-702).*

The project will help the District meet Integrated Management Plan goals and objectives designed to sustain a balance between water uses and water supplies and maintain compliance with the Republican River Compact. Among the specific objectives in the IMP the project will help achieve is reducing District-wide groundwater use under average precipitation conditions.

The primary goal in the district's Groundwater Management Plan is to keep groundwater levels at present levels or minimize declines to ensure future generations have an adequate water supply. The district's allocation system, prohibition on new irrigation wells, spacing requirements between irrigation wells and other rules and regulations have been efforts to achieve that goal and the proposed project will also help achieve this goal.

10. Are land rights necessary to complete your project?

YES☐ NO☒

If yes, provide a complete listing of all lands involved in the project.
N/A

If yes, attach proof of ownership for each easements, rights-of-way and fee title currently held.
N/A

If yes, provide assurance that you can hold or can acquire title to all lands not currently held.
N/A

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

Please refer to the responses to question #8.

12. Identify the probable environmental and ecological consequences that may result as the result of the project.

The District does not foresee any negative environmental or ecological consequences of the project. The purpose of the project is to produce positive consequences including preserving groundwater available for human and crop consumption, and wildlife and ecological systems to the extent that reduced groundwater use mitigates impacts to stream flow.

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 in parenthesis. 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.

   Nitrate levels in URNRD supply have increased from an average of 1.85 parts per million (ppm) in 1974 to 3.91 ppm. Testing in recent years has indicated nitrate levels above the accepted drinking water standard of 10 ppm in some

areas of the District. Recently, the URNRD created a new position for the sole purpose of analyzing the extent of the nitrate problem and to help determine a course of action.

Within the last year, water quality problems related to high uranium and arsenic levels forced the City of Benkelman in Dundy County to source and install a new water supply system, locating wells north of town. A recent University of Nebraska-Lincoln study established a link between nitrates and uranium levels in groundwater aquifers. "…Results indicate that nitrate, a primary contaminant, should be considered as a factor leading to secondary groundwater uranium contamination…" (Nolan J, Weber K, 2015).

The Village of Wauneta in Chase County is in the process of addressing problems associated with high arsenic levels in its drinking water supply. Rising arsenic levels have also been detected in the City of Imperial's water supply in Chase County. Research still needs to be conducted to establish whether there is a link between high nitrate and arsenic levels.

Heavily irrigated regions such as the URNRD are especially prone to high nitrate levels because irrigation can flush nitrates from plant root zones and into the groundwater supply – "The more irrigation takes place, the greater the chances for nitrate leaching," (Haller L, McCarthy P, O'Brien T, Riehle J, Stuhldreher T, 2013).

The model will include quality aspects so that we can better predict movement of contaminants such as nitrates through the URNRD's groundwater supply in relationship to populations within the URNRD and take action accordingly. This could include implementation of fertilizer application restrictions in regions with particularly high levels of nitrates.

It can be reasonably stated that the vast majority if not all of the residents within the URNRD could eventually be exposed to unacceptable nitrate levels in their drinking water. This is due to the density of agricultural land within the URNRD where fertilizers are applied. Approximately half of the URNRD's 1.7 million acres are cropland and 45% of the URNRD's 9,000 residents live in rural areas outside of cities and villages. The proximity of city and village wellfields to agricultural land also puts them at risk of eventual nitrate contamination.

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.

The Integrated Management Plan jointly developed and approved by the URNRD and Nebraska Department of Natural Resources has been formally approved four times. The initial plan became effective June 2, 2005; it was revised and approved and then became effective on April 3, 2008; it was revised and approved and became effective Nov. 1, 2010; and was revised and approved recently, becoming effective on Jan. 15, 2016. The district also has a groundwater management plan for its groundwater management area, which is the entire URNRD.

The District has taken a series of actions to achieve the IMP goals including: 1) Implementing the Rock Creek and NCORPE augmentation projects that have achieved, and will continue to ensure, compliance with the Republican River Compact as adopted in 1943 and as implemented in accordance with the Settlement Agreement approved by the U.S. Supreme Court in 2003. The augmentation projects kept Nebraska in compliance with the compact in 2013, 2014, 2015 and will be relied upon to do so in 2016. These actions have helped achieve the IMP goal of maintaining compliance with the compact. 2) Reached agreements with the other NRDs in the Republican Basin and the State that apportion Compact compliance responsibilities to the NRDs based on depletions to stream flow that occur within their respective Districts. This has helped achieve the second IMP goal of ensuring that water users within the District assume their share, but only their share of the responsibility to maintain compliance with the Compact; 3) Implemented a uniform groundwater allocation system whereby all water users within the District have the same allocation. By implementing the augmentation projects, the District has prevented water users in close proximity to the Republican and River and its tributaries from being subject to lower water allocations. This has helped achieve the third IMP goal of the District apportioning its share of Compact compliance responsibility equitably so as to minimize adverse economic, social, and environmental consequences arising from Compact compliance activities. 4) Continued to prohibit expansion of new irrigated acres and permanently retired approximately 1,500 acres from irrigation using District and federal funds. This has helped achieve the fourth IMP goal of protecting groundwater users whose water wells depend on recharge from the river or stream and the surface water appropriators on such rivers or streams from stream flow depletions caused by water uses begun after the time in which the Republican Basin was designated fully appropriated.

The proposed project helps achieve the following IMP goals and objectives in the following ways:
1) Maintain compliance with the Republican River Compact:

Through the groundwater modeling tools proposed in the project and the groundwater management options that will be an outcome of modeling, the project will help the URNRD identify where and how to reduce water consumption. Reductions in water consumption will help the State to not exceed its allocation under the Compact and/or limit the amount of excessive use that must be offset by increasing stream flow via stream flow augmentation projects developed in the Republican River Basin. Compliance with the Compact aided by reduced water use prevents statewide liability for noncompliance that include significant penalties. For instance, the State of Kansas recently sought but did not successfully receive a court judgement of approximately $70 million for Nebraska's noncompliance with the Compact in 2005-2006.

2) Prevent the initiation of new or expanded uses of water, with limited exceptions, that increase Nebraska's computed beneficial consumptive use of water within the URNRD, as required for compact compliance and by Nebraska law: The proposed modeling will be a tool in addition to the model to determine stream flow depletions caused by groundwater pumping for compact purposes to help the URNRD better assess what long term impacts current water uses at their current rates of usage will have on Nebraska's computed beneficial consumptive uses of water.

3) Reduce existing groundwater use within the URNRD by 20 percent from the 1998 to 2002 baseline pumping volumes under average precipitation conditions so that, when combined with stream flow augmentation and incentive programs, the URNRD's groundwater depletions are maintained within their portion of Nebraska's allowable groundwater depletions as computed through the use of the Republican River Compact Administration Model. Additionally, voluntary reductions in baseline pumping volumes will continue to be pursued by the URNRD with the incentive of limiting the level of long-term management actions that are necessary during compact call years: The purpose of the groundwater modeling and management options developed under the project is to reduce groundwater usage to help stabilize groundwater levels. The reduction in usage projected as an outcome of the project will aid in attainment of goal to reduce groundwater pumping by 20 percent from 1998-2002 baseline pumping levels.

4) Cause the reductions in water use required for compact compliance to be achieved through a combination of regulatory, incentive, and augmentation programs designed to reduce consumptive use. To the extent funds are available, incentive programs will be made available through targeted incentive programs: Augmentation projects designed to offset depletions to stream flow have been developed by the URNRD to help accomplish this objective. The proposed project represents an attempt to reduce depletions via reductions in groundwater pumping.

The primary goal in the district's Groundwater Management Plan is to keep groundwater levels at present levels or minimize declines to ensure future generations have an adequate water supply. The district's allocation system, prohibition on new irrigation wells, spacing requirements between irrigation wells and other rules and regulations have been efforts to achieve that goal and the proposed project will also help achieve this goal.

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.

     The groundwater modeling proposed in the project will help identify volumes and distribution of recharge from various excess flow diversion projects, e.g. from different points along the South Platte River. The URNRD has already begun assessing estimated volumes of excess, flood flows that could be diverted from various points along the South Platte; the model could help estimate how much diverted flow would result in groundwater recharge at different locations in the URND and at what volumes.

     The groundwater management options that will be developed as part of the project and that will be an outcome of the modeling effort will determine the level of reductions in aquifer depletion. The long-term goal of pumping reductions created by the modeling and development of management options will be two-fold: Reducing pumping so that it is, during average precipitation years, 20 percent less than 1998-2002 baseline pumping; and that the reductions are part of a steady progression leading to eventual aquifer stabilization. Both decline rates and pumping levels vary across the URNRD so new programs and regulations designed to achieve both goals may also vary. It is reasonable to expect, however, that the project will produce efforts in all parts of the URNRD, which includes approximately 430,000 irrigated acres, to reduce pumping.

     Base flow to streams within the URNRD will be increased via the project to the extent that reduced groundwater pumping occurs in areas where groundwater is hydrologically connected to streams, how much pumping is reduced in those areas, and for how long there is reduced pumping.

Should the project result in programs and regulations that reduce pumping by approximately 10 percent in hydrologically connected areas of the URNRD, for example, annual additions to stream flow could be approximately 3,000-4,000 acre feet.

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 project will benefit agricultural use by preserving water supplies for future use that would not otherwise be available if groundwater use was not reduced. Municipal uses of water will also be protected since all municipal supplies within the URNRD are effected by agricultural use. Additionally, the approximately 45% of the URNRD's residents who rely on domestic wells will benefit by having their water supplies protected to the extent that withdrawals from nearby irrigation wells are reduced due to the project.

   Besides the inherent benefit to wildlife including fish from having more stream flow, there are three reservoirs within the District where there would be a recreational benefit to increased water supplies. Rock Creek Lake in Dundy County, Champion Lake in Chase County and Enders Reservoir in Chase County would benefit. In particular, Champion Lake and Enders Reservoir have been impacted by declining Frenchman Creek flow impacted by groundwater pumping that the project could benefit.

   All of the above-listed benefits of the project are directly connected to the overarching goal of the project to conserve and preserve water in the URNRD. Achievement of that goal is needed to sustain livelihoods in the URNRD, which are in in some way touched by the economic benefits that irrigated agriculture provides to the area.

   If efforts such as those proposed in the project are not taken to preserve water, areas of the URNRD will experience groundwater availability problems that will threaten the ability to generate enough water to adequately irrigate crops. One of the main purposes of the project is to provide projections of how long supplies sufficient to irrigate with will remain unless changes are made. However, based on data that needs to be updated, there are approximately 70,000 acres in the URNRD that will not be able to be fully

irrigated within approximately 40 years should current rates of water usage continue.

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.

   Once the model is completed and operational, we will have a foundation on which to base water-management decisions such as how much allocations need to be reduced in different parts of the URNRD to help meet water sustainability goals. Should additional regulations and programs be implemented, uses of water, including possibly beneficial uses, will be reduced. However, the intent will not be to reduce water use to the extent that it significantly reduces crop yields. Our hope is to eliminate excessive uses of water that don't substantially increase yields and that will be identified with help from a separate project for which we are seeking a WSF grant – the URNRD Groundwater Monitoring and Preservation Project.

   The benefit of eliminating what are determined to be excessive uses is to extend the supply of water that can be beneficially used, aiding residents of the URNRD and the State.

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 table below, which is also on p. 12, describes the cost of the project. The model will not require ongoing O&M expenses. The alternative to not producing a groundwater model for the URNRD is to simply not have a model on which to base water-management decisions. This would hinder our ability to stabilize water levels because we would not have a clear understanding of what level of pumping would be needed to do so. Alternatively, we would be at risk of establishing regulations that were more stringent than what is

reasonable, limiting the beneficial use of water significantly and causing undue harm to the area economy.

We believe the project is cost effective because it will help preserve water without the economic or resource costs associated with a "trial-and-error" approach where regulations either too stringent or not stringent enough were implemented over the course of a long period of time to identify what regulations were appropriate.

Activity	Cost Year 1	Cost Year 2	Cost Year 3	Total
Modeling/Data Collection	$150,000	$150,000	$15,000	$315,000
Analysis and Management Options	$0	$30,000	$60,000	$90,000
Total By Year and Fund	**$150,000** (WSF $90,000 URNRD $60,000)	**$180,000** (WSF $108,000 URNRD $72,000)	**$75,000** (WSF $45,000 URNRD $30,000)	**$405,000** (WSF $243,000 URNRD $162,000)

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.

   The compact the project will help meet is the Republican River Compact between Nebraska, Kansas and Colorado as adopted in 1943 and as implemented in accordance with the Settlement Agreement approved by the U.S. Supreme Court in 2003.

   Water consumption reduced under the project will help ensure Nebraska's compact allocation will not be exceeded. It will also reduce the amount of water use in excess of the allocation that must be offset by increasing stream flow via stream flow augmentation projects developed in the Republican River Basin. The project will help prevent and/or reduce statewide liability for noncompliance that include significant penalties. As an example, the State of Kansas recently sought but did not successfully receive a court judgement of

approximately $70 million for Nebraska's noncompliance with the Compact in 2005-2006.

Recently developed augmentation projects in the Basin, the Rock Creek Augmentation Project in Dundy County and the NCORPE Augmentation Project in Lincoln County have successfully kept the state in compliance with the Compact. But should their capacity at some be point be insufficient to ensure compliance, the only other available option to the NRDs in the Republican Basin including URNRD would be to impose stricter allocations, or prohibit irrigation altogether, on acres close to the Republican River and its tributaries (42,445 acres in URNRD) in dry years when compliance action was needed. By reducing water use and therefore the impacts on stream flow caused by groundwater pumping that are considered usage of Nebraska's compact allocation, the project could help prevent or at least mitigate special regulations on water users close to the Republican and its tributaries.

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 Untied 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.

Continued aquifer depletion that the proposed project seeks to address could impact both critical infrastructure and the economy at the local, regional and national levels, according to the U.S. Department of Homeland Security (DHS) Office of Cyber and Infrastructure Analysis. Decreases in critical infrastructure caused by dwindling water supplies could be experienced in the food and agriculture, energy, and chemical sectors according to the analysis.

Specifically, food and fuel (ethanol) prices could rise due to less crop production and water and wastewater systems could be negatively impacted by growing populations and declining groundwater levels. Transportation systems infrastructure could be affected by potentially less demand for transportation services as a result of less agriculture and ethanol production. Interestingly, for purposes of projecting future crop yields that might impact those infrastructure areas, DHS used Dundy County in our District as the lone example.

DHS modeling showed that in the future, dryland crop yields might actually decline slightly and reliance on groundwater irrigation could be more tenuous. “Whereas farmers have used irrigation to offset impacts of climate variability on crop yields in the past, the depletion of the High Plains Aquifer could hinder their ability to do so in the future,” according to the report. “As groundwater availability decreases over time, it is possible that more agricultural land will be converted from irrigated to dryland farming.”

Counties of highest concern overlying the aquifer are those the modeling described in the report showed as having 25 or fewer years of groundwater use available. No such counties in Nebraska were show to be facing that imminent of a problem, but of the seven counties in Nebraska where the life of the aquifer usable for irrigation was shown to be 50-100 years, two are in the District (Dundy and Chase). One of the four counties in the Nebraska with a usable aquifer life of 100-200 years was in the District (Perkins).

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.

Average nitrate levels within the URNRD have risen 111 percent since water quality testing began in 1974 and now stand at 3.91 ppm. This is still well below the maximum acceptable level of 10 ppm but it is prudent to take action now to slow or eliminate the rate of increase.

Because the modeling and development of management options to reduce irrigation withdrawals to the extent modeling indicates is needed to slow and stop declines will lessen withdrawals, less leaching of nitrates into the groundwater supply may occur. The URNRD is also currently in the process of identifying areas of the district where nitrate levels are high relative to the district average and at risk of reaching 10 ppm in the short and mid-term. The modeling conducted as part of this project will help identify the rate at which nitrates are migrating through the aquifer so programs can be developed to reduce additional exposure to and increases in nitrate levels.

The URNRD has annually taken water samples from both domestic and irrigation wells for more than 40 years to test for contaminants. Rules and regulations have been established that require more testing in areas where high nitrate levels are detected. Additionally, limitations on groundwater use

(allocations) were established in 1979. Allocations were set for groundwater quantity purposes but were expected to help slow the rate of nitrate infusion into the groundwater supply.

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 jurisdiction that supports the project is the URNRD. We believe our regulating and managing all ag water use in the area since the 1970's makes it uniquely qualified to pursue the proposed project.

The District's 2015-2016 tax levy is $.055216 per $100 of valuation and will generate $2,035,000 of revenue. The District's other source of revenue is the $10-per-irrigated-acre occupation tax that generates approximately $4.4 million annually.

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 URNRD's long term plan, master plan, integrated management plan and groundwater management plan all seek to preserve water within the URNRD. Slowing and eventually stopping groundwater declines, in one form or another, is included as a primary goal in the long range, master and groundwater management plans. The URNRD's 2010-2020 master plan, for instance, has the stated goal of "developing, promulgating and enforcing rules and regulations that provide for appropriate protection of the aquifer so as to

slow and eventually stop water table declines in order that beneficially usable quantities of water remain in the aquifer; incentives to use water efficiently; conservation of groundwater; and maintaining or enhancing groundwater quality."

The URNRD's Integrated Management Plan, first approved in 2005, revised and approved in 2008 and 2010, and revised and approved again in January 2016, has goals and objectives with a purpose of "sustaining a balance between water uses and water supplies so that the economic viability, social and environmental health, safety and welfare of the river basin…can be achieved and maintained for both the near and long term."

The District has pursued sustainable water use since the 1970's when it became, in 1979, the first entity in Nebraska and possibly the country to limit agricultural water use by establishing an allocation on the use of groundwater. Since that time, allocations have been reduced by approximately 40%. The regulations have slowed groundwater declines compared to what was predicted to occur absent regulations. Average groundwater declines are approximately 60% less than what USGS predicted they would be if regulations weren't established (Lappala, 1978) and the most significant groundwater declines are approximately half what USGS estimated would occur without regulations.

In addition to allocations, regulations limiting proximity of irrigation wells to one another were approved in 1979 and again in 1992. In 1997, the District approved and implemented the first well-drilling moratorium in Nebraska. Larger declines in areas that abut the District in Kansas and Colorado which do not have regulations or whose regulations are less stringent also illustrate the beneficial impact of these actions within the District. Average annual declines in areas of Kansas with a similar climate have been more than double what has occurred in the District.

Most recently, in 2013, the District made some of its most significant rules changes in its history when it restricted the use of unused allocation, or "carry-forward", and created new penalties for water users who use more than their water allotments. All agricultural water use has been metered since the late 1970's and approximately 400 wells are measured in the spring and fall. Metering, well measurements and allocations have created an extensive database from which the District can base decisions to further its long term goal of slowing groundwater declines in the District. The proposed project represents the next step in water management for the District.

The primary goal which the project will help achieve, mentioned in the response to the first part of this question, is to slow and eventually stop groundwater declines. The project will help achieve this goal by providing

information that can produce management decisions designed to reduce water use in ways that will help lead to aquifer stabilization.

The project will also help achieve the following objectives contained in the District's Long Range Implementation Plan:

- Develop, promulgate and enforce rules and regulations that provide for appropriate protection of the aquifer, incentives to use water efficiently, conservation of ground water, and maintenance and enhancement of groundwater quality: The project is directly related to this goal as the primary intent of the model will be to help the URNRD develop actions to preserve the aquifer.
- Conduct monitoring and other data collection activities and research necessary for interpretation of changes in groundwater levels and actual and potential pollution of the aquifer: The proposed project includes data collection to improve the operation of the model so it provides accurate interpretations of groundwater levels and the effects that irrigation withdrawals have on them.
- Cooperate with other agencies to plan and conduct data collection activities related to ground and surface water quantity and quality: The data collected as part of the project will be able to be shared with other experts in the fields of water quantity and quality such as the University of Nebraska-Lincoln.
- Reduce the potential for non-point contamination of ground and surface water through education, research, management practices, incentives and rules that protect the water but also minimize adverse effects on the economy of the area: Less water use and subsequently less leaching of nitrates into the groundwater supply via the project will help achieve this objective.

One of the URNRD's primary objectives related to groundwater quantity, contained in the district's groundwater management plan, is "to reduce the amount of groundwater being withdrawn." The proposed project will help achieve this objective.

Sustainability can only be achieved once we discover, to the best of our abilities, what rates of irrigation withdrawals can exist in hydrologically variable areas of the district without jeopardizing future access to water. The proposed project is meant to produce this understanding.

The target area of the project is the 1.7 million-acre land area of the District. The approximately 430,000 irrigated acres in the area are located throughout the District. The population of the area directly benefitting from the project is the 9,000 residents of the District and all residents of the Republican Basin and Nebraska generally that benefit from the agricultural output and stream flow generated in the District.

The District considers all residents of the District stakeholders in and beneficiaries of the project.

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.

The primary challenge the project seeks to address is maintaining adequate water supplies to support irrigated agriculture within the URNRD indefinitely. While the project is confined to the URNRD, it is to be expected that groundwater decline issues that the URNRD have experienced more than any other region of Nebraska will emerge in other parts of the state as well over time. The management options we develop based on the groundwater modeling proposed under the project may help offer guidance to other NRDs across Nebraska as they seek to address similar challenges in the future.

The project will address the problem of declining water levels in the URNRD by helping produce incentive programs and regulations within the district that will reduce the rates of declines. Some questions within the grant application have asked for quantification of water savings resulting from the project. This is in part what the project seeks to answer – how much does water use need to be reduced to stabilize groundwater levels and/or ensure supplies indefinitely and what actions will cause the necessary reductions?

The total number of people directly benefitting from the project is approximately 9,000, which is the population of the URNRD. However, to the extent that all Nebraska residents benefit from tax and other revenues associated with irrigated agriculture, we believe it is reasonable to suggest that the entire state will benefit from long-term reliability of irrigated agriculture in the district. To the degree which the project will lead to less water consumption and therefore lessened impacts on Republican River stream flow, the project will also help URNRD and the state maintain compliance with the Republican River Compact. Kansas' recent lawsuit against Nebraska alleging noncompliance in 2005 and 2006 illustrated the financial risk to Nebraska as a whole for noncompliance. Kansas did not eventually receive, but had sought, approximately $70 million in

The total number of acres in the district is 1.7 million, the amount that are irrigated is approximately 430,000.

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.

There are no other funding sources for the project so none exist that will jeopardize the project.

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.

There are seven watersheds defined by the U.S. Environmental Protection Agency that are entirely or partially contained within the District: Arikaree; Red Willow; Stinking Water; North Fork of the Republican; South Fork of the Republican; Upper Republican; and Frenchman. All are considered impaired waters for the following reasons:
Arikaree – E. Coli
Red Willow – E. Coli, Biointegrity; Chlorophyll; Dissolved Oxygen; Phosphorus
Stinking Water – E. Coli
North Fork of the Republican – E. Coli
South Fork of the Republican – E. Coli
Upper Republican – E. Coli; Chlorophyll; Dissolved Oxygen; Nitrogen; Phosphorus; Selenium
Frenchman – E. Coli; Chlorophyll; Selenium

To the extent that reduced groundwater pumping under the proposed project can mitigate decreases in stream flow, the project could reduce impairment of the Red Willow, Upper Republican and Frenchman watersheds by increasing dissolved oxygen and dilution of phosphorus, nitrogen and selenium. Less leaching of nitrogen and phosphorus due to reduced irrigation may decrease their presence in groundwater and therefore natural discharges to streams (base flow), improving watershed health.

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 project meets the following objective cited in the NeDNR September 2015 Annual Report and Plan of Work for the Nebraska State Planning and Review Process:

The Department will continue to update existing models and tools (p. 12): The modeling done via the proposed project will be available for use by the NeDNR as it seeks to gather additional information about the URNRD or as it considers changes to existing modeling tools.

The Department will continue to implement the Republican River Compact and ensure compliance through integrated management planning activities (p. 24): The proposed project to the extent it produces programs and regulations that reduce water consumption and depletions to stream flow caused by groundwater pumping will aid compact compliance.

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.

Congressional approval was required for the Republican River Compact to be entered into by Nebraska, Colorado and Kansas and Congressional approval would be required to dissolve it. Therefore, it is reasonable to consider the compact a federal mandate.

It was entered into with Congressional approval in 1943 and allocates the annual, average supply of the Republican River among the three states thusly: 49 percent to Nebraska; 40 percent to Kansas; and 11 percent to Colorado. The amount of water subject to those percentages varies annually depending upon stream flows.

Before a 2002 settlement agreement between the compact states, the accounting that determined each state's consumptive use under the compact

included surface water and alluvial groundwater for irrigation, municipal and industrial uses, and evaporation from U.S. Bureau of Reclamation Reservoirs. Subsequent to the 2002 agreement approved by the U.S. Supreme Court, depletions to stream flow caused by all groundwater use including from upland wells is included in the calculations. A groundwater model was developed to compute depletions to stream flow caused by groundwater pumping.

Annually, the State of Nebraska, using estimates of surface water supplies and depletions, forecasts whether action will need to be taken the following year to ensure compliance with the compact. A primary intent of the IMPs developed by the NRDs in the Republican Basin and NeDNR is to ensure compact compliance. One way it seeks to do this is by mitigating impacts on stream flow caused by establishing goals to reduce groundwater pumping. Reducing groundwater pumping is the main intent of the proposed project and, if achieved as projected, will therefore aid the federal mandate of compact compliance.

The compact by constraining uses to allocations between the states is naturally a limiting force on groundwater pumping and this has been demonstrated in many ways over the past approximately 20 years. All wells in the Lower and Middle Republican NRDs were metered because of the compact (wells in URNRD were metered because of water quantity concerns that predated compact issues); moratoriums on new irrigation development were established because of efforts to comply with the compact; and water use restrictions, or allocations, were implemented in the Lower and Middle Republican NRDs because of the compact (water quantity concerns predating compact concerns caused allocations in the URNRD). In this way, there is a direct connection between the federal mandate of compact compliance and water sustainability goals.

Section D.

PROJECT DESCRIPTION

1. Overview

In 1,000 characters *or less*, provide a brief description of your project including the nature and purpose of the project and objectives of the project.

The Upper Republican NRD (URNRD) currently lacks a groundwater model that can be used to help project aquifer reactions to varying levels of withdrawals for irrigation. This creates a deficiency in our ability to understand the usable life of the aquifer throughout the URNRD under both current rates of water withdrawals for irrigation, and the usable life assuming different withdrawal rates that could be dictated by revised regulations and/or creation of new programs designed to reduce groundwater pumping.

We propose to develop, with aid from the Water Sustainability Fund, a groundwater model that can aid our efforts to implement programs and regulations that achieve our goal of eventually stabilizing groundwater levels in the District. Knowing the consequences of different management actions using the best available information is vital to our efforts to attain this goal.

In order to develop and operate a useful model, additional data collection such as aquifer saturated thickness throughout the URNRD will be needed. We also plan to use the model to help predict movement and fate of nitrates in the groundwater supply to aid our efforts to mitigate the presence of and domestic exposure to nitrates.

Models are only useful if the information they produce also leads to action steps. Grant funds are also proposed to be used to engage consultants who will help us both analyze modeling results from a variety of scenarios and develop a suite of potential management actions based on the analysis. In addition to regulatory decisions and programs, the URNRD will utilize information from the project to educate constituents, without use of grant funds, on usable aquifer life under current water usage rates and rates of reduced usage. For example, the model may indicate that should current rates of usage continue the aquifer within a specific area will yield enough water to fully irrigate crops for another 40 years. Constituents in that area may be asked to consider that fate to others in which aquifer life is longer, even indefinitely longer, when water use is reduced to rates that the model indicates will produced various and desired aquifer-life

outcomes. This type of engagement with constituents will be essential as we plan for aquifer-stabilization programs in the district.

Better understanding aquifer behavior and reaction to different groundwater pumping scenarios within our district is needed to develop actions that will slow aquifer declines. Groundwater decline rates have slowed in the district over time through the use of allocations that have decreased by 40 percent since first being implemented in 1979. However, declines still pose a significant and widespread challenge to the district. Annually, groundwater levels drop an average of about .75 in the URNRD and on average groundwater levels are approximately 25 feet lower now than when irrigation development began in the 1960's. The steepest declines are approximately 60-70 feet. Additional steps such as those proposed in the project need to be taken to ensure water supplies in some areas of the district don't diminish to levels where fully irrigating crops is not possible within coming decades.

2. Project Tasks and Timeline

Identify what activities will be conducted by the project. For multiyear projects please list what activities are to be completed each year.

2017: Data collection and model development will occur. Data collection will primarily consist of gathering information on aquifer properties such as saturated thickness so an accurate model can be developed. A work plan will also be developed at this time and will likely include two consultants to ensure that the model contains all components necessary to achieve desired purposes. All sources of available data will be identified in the work plan, as well as sources of additional data that need to be developed for construction of, and inputs to, the model once completed. Desired uses of the model will also be identified in the work plan. Model construction may occur in mid to late 2017.

2018: Model development will occur at this time and during the latter part of the year the model may be operational. Also in 2018, some preliminary analysis of modeling scenarios may be conducted to begin consideration of management options.

2019: Final calibrations to the model will likely be completed at this time and the model will be used to assess a wide range of management actions on aquifer levels throughout the district. Goals and objectives relative to management actions resulting from the model and their impact on aquifer life will be analyzed. Constituents in the district will be informed of the analysis so they can participate in the decision-making process that

will determine new programs/management steps designed to help stabilize groundwater levels.

3. Partnerships

Identify the roles and responsibilities of agencies and groups involved in the proposed project regardless of whether each is an additional funding source. List any other sources of funding that have been approached for project support and that have officially turned you down. Attach the rejection letter.

N/A

4. 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.

The total cost of the project is $405,000: $243,000 funded by WSF and $162,000 by URNRD. They are the only two proposed funding sources and funding from the URNRD is confirmed. If funding from the WSF is not obtained, the project may not proceed.

5. Support/Opposition

Discuss both support and opposition to the project, including the group or interest each represents.

There is no known opposition to the project and it is supported by the URNRD. Members of the URNRD Board of Directors are particularly interested in an assessment of and educational process targeting aquifer life under current and different rates of groundwater withdrawals.