

Memorandum

To: Papio-Missouri River Natural Resources District Programs Projects and Operations Subcommittee

From: Paul W. Woodward, PE, Groundwater Management Engineer

Date: August 7, 2020

Re: Nebraska Environmental Trust Grant for the Nebraska Know Your Well Program

Over the past 4 years, the Know Your Well (KYW) program (<https://knowyourwell.unl.edu/>) has been funded by grants from the Nebraska Environmental Trust (NET) and carried out by the University of Nebraska in Lincoln. The program allows high school students and teachers to conduct groundwater quality testing from private domestic wells in rural areas near their city or town. Duplicate samples are also tested by the UNL Water Sciences Laboratory and results are sent back to each school and the participating well owners. Students are educated about the importance of groundwater quality testing and in turn help educate others in their community (see attached brochure with past results).

Under a new NET grant application, the Nebraska Know Your Well program is proposing to expand to even more schools across Nebraska with the assistance of several Natural Resource Districts (NRDs). NRDs supporting this grant application are agreeing to provide staff time and travel to educate and coordinate with as many as 4 to 6 high schools in their District. This staff time and expense is estimated at approximately 20 hours per school per year and will amount to a \$12,000 to \$15,000 match per NRD over the three-year grant period.

Our District is agreeing not only to participate as a partner in the Know Your Well program, if the NET grant is approved, but also oversee administration of the NET grant requirements. This may amount to an additional \$3,000 to \$5,000 in-kind cost share for the Papio NRD. The UNL Water Sciences Lab will still be providing the required field-testing equipment, lab testing, and training. One part-time coordinator, responsible for the program state-wide, will be hired and stationed at the University of Nebraska at Kearney.

A proposed letter of support for the grant from the District is attached. The total projected cost-share for the state-wide grant application is:

YEAR	TOTAL	NET GRANT	NDEE Project Grant	USGS 104 Funding	UNL + UNK IN KIND	NRDs IN KIND ¹	# Schools
1	\$ 681,924	\$337,432	\$ 30,000	\$ 5,000	\$ 249,492	\$ 60,000	40
2	\$ 486,744	\$214,132	\$ 50,000	\$ 5,000	\$ 172,612	\$ 45,000	30
3	\$ 390,945	\$140,768	\$ 70,000	\$ 5,000	\$ 138,177	\$ 37,000	25
Total	\$ 1,559,613	\$692,332	\$ 150,000	\$ 15,000	\$ 560,281	\$ 142,000	

Staff recommends that the subcommittee recommend to the Board of Directors that the General Manager be authorized to submit and administer a Nebraska Environmental Trust grant application for the Nebraska Know Your Well program, subject to changes deemed necessary by the General Manager and approval as to form by District Legal Counsel.

August 6, 2020



Nebraska Environmental Trust
700 S 16th Street
Lincoln, NE 6850-4913

RE: Know Your Well Project, Nebraska Environmental Trust Grant Application – Papio-Missouri River Natural Resources District Letter of Support

Dear Nebraska Environmental Trust Board, Reviewers and Staff:

Over the past four years, the Know Your Well (KYW) program has been funded by grants from the Nebraska Environmental Trust (NET) and carried out by the University of Nebraska in Lincoln. The program allows high school students and teachers to conduct groundwater quality testing from private domestic wells in rural areas near their city or town. Duplicate samples are also tested by the UNL Water Sciences Laboratory and results are sent back to each school and the participating well owners. Students are educated about the importance of groundwater quality testing and in turn help educate others in their community.

Under this new NET grant application, the Know Your Well program is proposing to expand to even more schools across Nebraska with the assistance of several Natural Resource Districts (NRDs). NRDs supporting this grant application are agreeing to provide staff time and travel to educate and coordinate with as many as 4 to 6 high schools in their District. This staff time and expense is estimated at approximately 20 hours per school per year and will amount to a \$12,000 to \$15,000 match per NRD over the three-year grant period.

The Papio-Missouri River Natural Resources District (PMRNRD) is agreeing to participate as a partner in the Know Your Well program, if the NET grant is approved, and provide staff time and travel in accordance with the grant. Including time for grant administration, the PMRNRD is expecting to contribute at least \$15,000 per year in in-kind costs toward the project. The UNL Water Sciences Lab will still be providing required field testing equipment, lab testing, and training. One part-time coordinator, responsible for the program state-wide, will be hired and stationed at the University of Nebraska-Kearney or other proposed central location.

The PMRNRD is also willing to consider matching scholarship funding, up to \$500 per student, with the appropriate Nebraska University for any student who participates in the KYW program and is enrolling in a degree program associated with water or natural resources.

Our NRD supports this NET grant application and appreciates your consideration of continuing this important educational program. Feel free to contact us at the letterhead address or phone number.

Sincerely,

John Winkler
General Manager

Growing Know Your Well and Groundwater Science in Nebraska
*Daniel Snow, Water Sciences Laboratory, Nebraska Water Center,
 and Daugherty Water for Food Global Institute*

Know Your Well (KYW) is a Nebraska Environmental Trust-funded project that has been engaging high school students and teachers across the state for the past four years. Roughly 160 students from 19 schools across Nebraska participated between 2017 and 2019. Students in FFA chapters and science clubs have been trained on well construction, land features related to groundwater quality and how to properly collect and test water samples from domestic wells.



Figure 1. UNL graduate student Christopher Olson explains how to calibrate and use a portable water quality probe for students from Waverly high school in 2017.

Students are trained to use portable meters and commercial test kits to measure atrazine, coliform bacteria, nitrate, copper and manganese using visual comparison kits and a portable colorimeter (figure 1). After training, students independently collect and test samples from up to 20 wells from a radius of up to 50 miles of their schools. They upload data about well location construction, land use and other features that can impact water quality using a KYW App available for Apple iOS. Students also collect, preserve, and send split samples to be tested at the Water Sciences Laboratory and are provided with a copy of the results for the well owner. A password secured online database allows only students and their teachers to access their results to use for high school research presentations and projects.

Figure 2 shows how results compare between student measurements and the laboratory results. All well owner-specific information is scrubbed from the online database. Students have given public presentations to local agencies, at the statewide FFA convention and Junior Academy of Sciences meetings. Video demonstrations of the kits and the app are available through the project website: Knowyourwell.unl.edu. A smaller project involving 5 schools in the Bazile Groundwater Management Area (Phase II) is underway between 2019 and 2021.

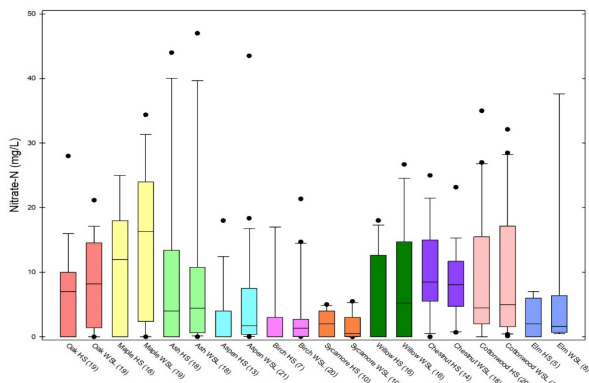


Figure 2. Comparison of high school student reported nitrate-N to WSL laboratory split sample results for 10 of the participating schools (HS names are aliases). Colors are sample results for each school.

Our goals in the proposed project (Phase III) are to extend the scope and involve a larger number of schools, include studies of urban and suburban well water quality, and engage Nebraska Natural Resources Districts and other interested partners to help with training and coordination. We also hope to improve the mobile application used by the students so they can better assist in statewide crowdsourced water quality data collection. Ultimately, we plan to look for ways to increase the long-term sustainability of the program and, as a result, contribute to the sustainability of Nebraska's drinking water.

Estimated NRD Commitment per School

During Phase I of the project, one graduate student/mentor travelled over 20,000 miles to meet one-on-one with teachers and students. (The number

of trips were higher during year one, during project development and when the schools were close to Lincoln.) Two visits per school was the minimum, with the first trip dedicated to delivering sampling and testing equipment, introducing the students to well water contamination issues and how to use the Nebraska Department of Natural Resources well registration database to select wells. The second trip was scheduled after the high school students had identified and secured permission to access wells to sample. The graduate student/mentor accompanied the high school students on the sampling trip, showed them how to use the equipment and how to conduct an on-site assessment of the area around each well. After samples were collected, the mentor went back to the classroom to help them finish and record each well water test. He then brought the well water samples back to the Water Sciences Laboratory for additional analysis. Each school visit took approximately 4 hours. For Phase III no more than 20 mentor hours per school is expected.

University of Nebraska support

The University will provide training materials, as well as all sampling and testing equipment. UNL will work with each NRD to schedule training and update training materials to meet the needs of their district. Example training videos are currently available on the KYW website. School water testing kit contents are listed below and can be modified to meet the needs of individual schools and NRD water quality issues. The kit contents listed below cost about \$950 per school. The Phase II Bazile Groundwater Management Area schools are also supplied with a CHEMetrics V-2000 portable colorimeter for nitrate-N testing at a cost of about \$1200 per school. Vacuvial kits using the colorimeter are less expensive than the visual comparison kits listed below and help offset the cost for the colorimeter.

Laboratory costs for the analysis of 18 pesticides residues, nitrate-N, ammonia, chloride, sulfate, calcium, magnesium, iron, manganese, arsenic, and uranium cost approximately \$160 per well (\$3,200 per school if they sample 20 wells total). Including supplies and laboratory testing, the total cost is roughly \$4,500 per school.

NET Know Your Well Project Sampling and Testing Supplies

What is in the Box	Company	Model #	# of Tests Possible
Ammonia Test Kit	CHEMetrics	K-1510	30
Atrazine Strip Test Kit	Abraxis	PN 500009	20
Calcium Hardness Test Kit	CHEMetrics	K-1705	30
Chloride Test Kit	HACH	89231-234	100
Colilert Tests	IDEXX	98-12972-00	20
Copper Test Kit	CHEMetrics	K-3510	30
Iron Test Kit	CHEMetrics	K-6010	30
Manganese Test Kit	CHEMetrics	K-6502D	30
Nitrate Test Kit	CHEMetrics	K-6909D	30
Nitrite Test Kit	CHEMetrics	K-7004	30
Handheld Blacklight			Unlimited
Multi-Parameter Tester 35	Oakton		Unlimited
Additional Supplies			
Box of pH 7 Buffer Packs	Oakton		
Five 400mL Plastic Beakers			
Garden Hose Adapter	WATTS		
10' Clear Vinyl Hose	Tomahawk		
Kimwipes	Kimtech		
Large Nitrile Gloves	Fisherbrand		
Medium Nitrile Gloves	Fisherbrand		
500mL Wash Bottle	Fisherbrand		
Other Supplied Items			
Stillair Incubator			
Igloo Cooler			

