

Water Committee Meeting
Tuesday, December 28, 2021 6:00 PM
Lower Platte North NRD Office
P.O. Box 126
Wahoo, NE 68066

1. UNFINISHED BUSINESS

2. REGULATORY

A. GROUND WATER MANAGEMENT AREA

1. Irrigated Acre Transfer

A request from Jamie Yindrick to transfer irrigated acres to Section 2-16N-3E from Section 9-15N-4E (located just west of Bruno in SQS #1) and Section 13-16N-2E. The land receiving the acres does have 2 active irrigation wells but the acres were never certified with the NRD. Jamie has submitted a replacement well permit for G-136646, but when it was originally drilled it hit rock and never got to full depth.

The committee asked staff to develop a transfer policy for certified irrigated acres. Lower Loup NRD has a transfer policy, which staff will review along with other NRDs with these policies. Staff plans on having a draft transfer policy for review at the January Committee Meeting.

Information is attached.

Sections 2 and 13 are located in Octavia Groundwater Aquifer Subarea, with Section 9 located in Prague Aquifer Subarea.

LPN - Section Q Groundwater Transfer

Rule 1 Transfer Off Overlaying Land

(1) A permit is required for the transfer of groundwater off overlaying land for any purpose described in (2). Upon receipt of an application for the transfer of groundwater off overlaying land, the District shall provide notice of the application by publishing it on the agenda for the next regularly scheduled Water Committee meeting. Any affected party may object to the transfer of groundwater by filing written objections, specifically stating the grounds for such objection, in the office of the District on or before the second regularly scheduled Board meeting following publication of notice in the Water Committee's agenda. Late objections will not be considered. Upon the filing of such objections or on its own initiative, the District shall conduct a preliminary investigation to determine if the withdrawal, transfer, and use of groundwater is consistent with the requirements of subsection (2) of this section and all rules and regulations of the District. Following the preliminary investigation, if the District has reason to believe that the withdrawal, transfer, and use is consistent with all rules and regulations of the District, but

may not comply with one or more other requirements of subsection (2) of this section, the District shall request that the Department of Natural Resources hold a hearing on such transfer.

(2) Any person who withdraws groundwater for agricultural purposes, or for any purpose pursuant to a groundwater remediation plan as required under the Environmental Protection Act, including the providing of water for domestic purposes, from aquifers located within the District may transfer the use of the groundwater off the overlying land if the groundwater is put to a reasonable and beneficial use within the State of Nebraska and is used for an agricultural purpose, or for any purpose pursuant to a groundwater remediation plan as required under the Environmental Protection Act, including the providing of water for domestic purposes, after transfer, and if such withdrawal, transfer, and use (a) will not significantly adversely affect any other water user, (b) is consistent with all applicable statutes and District rules and regulations, and (c) is in the public interest.

(3) No transfers shall be granted into any area with greater restrictions than the originating land upon which the transfer shall occur except as allowed by 46-742.

2. Phase Area Update

Dan Snow - UNL gave a presentation about the vadose soil and water sampling from LPN nitrogen management areas. Dan commented on his presentation that the nitrate levels in the majority of the samples were a mixture of organic and inorganic nitrogen. Tylr Naprstek - LLNRD gave an update on what Lower Loup has been doing in their new management area. They have also done some vadose soil sampling.

The full report is attached and the conclusion is shown below from the report.

Conclusions

Based on the trends of groundwater and vadose zone nitrate levels in this area of the LPNDRD, there is clearly continued loading of nitrate to the water table. The Bellwood Phase 2, Richland and Schuyler Phase 2 and 3 Groundwater Management Areas have some of the highest groundwater nitrate concentrations of the district. Analysis of six deep vadose zone samples shows pore water nitrate concentrations with location averages ranging 8.82 from 42.55 mg/L, similar to local groundwater concentrations. Vadose zone nitrate was highest beneath cropland with continuous corn and soybeans, while alfalfa, grass, and cover crops had much lower nitrate levels. Except for 2 wells, arsenic and uranium concentrations in groundwater samples were generally below the maximum contaminant level for drinking water. Stable isotope analysis of nitrate in the groundwater and vadose zone samples indicates over half of nitrate nitrogen is likely from the overapplication of commercial fertilizer. Several samples show evidence of enrichment by denitrification, especially grab samples taken near the water table, and several have nitrogen isotope composition characteristic of a mixture of organic (manure) nitrogen and commercial fertilizer. Comparison of sites with enriched nitrogen to manure application can help confirm the importance of this source. The majority of samples, however, have nitrogen isotope composition similar to commercial (inorganic) nitrogen, and thus efforts to limit the application of fertilizer is recommended. Future vadose zone and groundwater sampling in these areas

will provide information on the effectiveness of any changes in nutrient management practices.

3. Well Permit Program

4. Variance Scoresheet

Attached is the current variance scoring sheet that LPN utilizes. Staff visited with Brian Bruckner and Mike Murphy from LE on how they score the variance applications. Lower Elkhorn uses NASS for soils and gives a minimum criteria before proceeding onto the other scoring parts of the variance. They look at well density and pumping potential but not continuous and non-continuous tracts. They also do not consider Best Management Practices at this time.

Tyler explained the Lower Loup variance process. Lower Loup uses well density and soils as part of their scoring process. They do not use Best Management Practices in the scoring either.

5. Remediation Water

Duane Bellar contacted NRD staff and is looking at expanding irrigated acres on the EPA site with Lindsay Manufacturing. He will be adding an additional 75-80 acres by completing the full round on a 3/4 round pivot and adding an additional 45 acre swing arm pivot. The sites are located in Section 20 and 21, Township 20N, Range 3W, just east of Lindsay. The groundwater being used is remediation water from Lindsay Manufacturing.

Committee discussed the land application of the sites and the soil class that the pivot would be watering.

6. Bellwood Phase 2 Area

7. 2021 is the nineteenth year for this Phase 2 Area.

		11.	14.	17.	20.
	9.				
		12.	15.	18.	21.
8.					
	10.				
		13.	16.	19.	22.

23	24	25	26	27	28
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35	36	37	38	39	40
41	42	43	44	45	46

47	48	49	50	51	52
53	54	55	56	57	58
59	60	61	62	63	64
65	66	67	68	69	70
71	72	73	74	75	76

77	78	79	80	81	82
83	84	85	86	87	88
89	90	91	92	93	94
95	96	97	98	99	100
101	102	103	104	105	106

10	108	109	110	111	112
11	114	115	116	117	118
11	120	121	122	123	124
12	126	127	128	129	130

131. Richland - Schuyler Phase 3 Area

132. 2021 is the sixth year of this Phase 3 Area. This Phase 3 area went into effect September 1, 2015. The 55 sections of this area first went into a Phase 2 Area in 2004. The ten sections that were in Phase 2 are now in Phase 3. As such, the 2020 and 2021 numbers (at bottom of table) are for 65 sections.

133.	Year	134. Nitrate-nitrogen Range	135. Percent	136. Nitrate-nitrogen	137. 0 to 8.0 ppm	138. Percent	139. Nitrate-nitrogen	140. 8.0 to 10.00 ppm
147.	2004	148. 0 to 47 ppm	149. 30% (42 of 139)	150. 10%	151. 10%	152. 10%	153. 10.2%	154. 10%
153.	2005	154. 0 to 120 ppm	155. 31.3% (74 of 236)	156. 10.2%	157. 10.2%	158. 10.2%	159. 10.2%	160. 10.2%
159.	2006	160. 0 to 53 ppm	161. 28% (50 of 181)	162. 14%	163. 14%	164. 14%	165. 14%	166. 14%
165.	2007	166. 0 to 99 ppm	167. 32% (75 of 231)	168. 10%	169. 10%	170. 10%	171. 10%	172. 10%
171.	2008	172. 0 to 46 ppm	173. 28% (53 of 190)	174. 12%	175. 12%	176. 12%	177. 12%	178. 12%
177.	2009	178. 0 to 57 ppm	179. 33% (72 of 216)	180. 6%	181. 6%	182. 6%	183. 6%	184. 6%
183.	2010	184. 0 to 57.5 ppm	185. 31% (70 of 229)	186. 7%	187. 7%	188. 7%	189. 7%	190. 7%
189.	2011	190. 0 to 65.8 ppm	191. 28% (67 of 241)	192. 9%	193. 9%	194. 9%	195. 9%	196. 9%
195.	2012	196. 0 to 52.6 ppm	197. 29% (70 of 241)	198. 9%	199. 9%	200. 9%	201. 9%	202. 9%
201.	2013	202. 0 to 94.0 ppm	203. 25% (63 of 252)	204. 9%	205. 9%	206. 9%	207. 9%	208. 9%
207.	2014	208. 0 to 101.0 ppm	209. 27% (68 of 251)	210. 9%	211. 9%	212. 9%	213. 9%	214. 9%
213.	2015	214. 0 to 53.3 ppm	215. 23% (55 of 238)	216. 12%	217. 12%	218. 12%	219. 12%	220. 12%
219.	2016	220. 0 to 50.5 ppm	221. 25% (58 of 228)	222. 10%	223. 10%	224. 10%	225. 10%	226. 10%
225.	2017	226. 0 to 53.4 ppm	227. 25% (60 of 238)	228. 6%	229. 6%	230. 6%	231. 6%	232. 6%
231.	2018	232. 0 to 56.9 ppm	233. 26.5% (50 of 189)	234. 6.3%	235. 6.3%	236. 6.3%	237. 6.3%	238. 6.3%
237.	2019	238. 0 to 39.4 ppm	239. 25% (53 of 209)	240. 11%	241. 11%	242. 11%	243. 11%	244. 11%

243. 2020	244. 0 to 50.8 ppm	245. 26% (6 of 261)	246. 6% (5 of 261)
249. 20 21	250. 0 to 43.0	251. 25.5% (67 of 263)	252. 8.4% (22 of 263)

At the final meeting in Schuyler, a producer brought his water sample (the result [19.1 ppm] is included in the above table.

255. LPNNRD Online Reporting Sessions

The LPN conducted 9 meetings during November and December to assist producers in entering their reports online. Staff also did an informal survey on potential management practices.

Two producer meetings were held at Hruska Library in David City - for online reporting. Seven producers attended out of 23 producers in the area.

Seven producer meetings were held at the Schulyer Public Library - for online reporting. 45 producers, farm managers, agronomists attended. Staff has also met with four other producers for online reporting. There should be 83 producers submitting reports.

Staff have received some paper copies of the reports along with producers doing online submittal on their own.

Staff would like the Committee to recommend to the Board for considering a \$100 donation to both libraries as they did not charge any rental fees.

256. Lower Platte River Basin Water Management Plan Coalition (LPRBC)

John Engel - HDR will attend the Board Meeting on January 10 to give an update on the next 5-year allotment.

B. LIVESTOCK WASTE PERMITS

C. The LPNNRD has received # 1 livestock permit applications from DEQ since the last Water Committee meeting.

The Board passed a motion to stay neutral on livestock facilities and the NRD responsibility is for the permitting of high capacity wells. Manure application is usually treated as any commercial fertilizer, which soil sampling and manure analysis should be conducted and handled by NDEE.

D. Name	E. Livestock	F. Type of Permit	G. Legal Description
I. Cattau Finisher #3	J. Swine	K. Propose New Operation	L. E1/2 NE1/4 21-19N-1E
N.	O.	P.	Q.
S.	T.	U.	V.
X.	Y.	Z.	AA.

Description of permit application - Finishing Swine >55 - 5,000 head or Nursery Swine <55 - 12,500 head.

3. GROUND WATER PROGRAMS

A. DECOMMISSIONED WELL PROGRAM

1. Well Estimates

2. 3 new wells has been reviewed and approved for decommissioning since the last Committee meeting.

3. Well Owner	4. Type of Well	5. Cost Share Estimate	6. County
7. Charles Emanuel & Sons Inc	8. Irrigation	9. \$613.87	10. Dodge
11. Charles Emanuel & Sons Inc	12. Irrigation	13. \$569.96	14. Dodge
15. Gillwell Foundation	16. Domestic	17. \$744.75	18. Saunde

19. Plugged Wells

20. # wells have been plugged, reviewed, and ready for cost share payment approval this month.

21. Well Owner	22. Type of Well	23. Cost Share Estimate	24. County
25.	26.	27.	28.
29.	30.	31.	32.
33.	34.	35.	36.

B. LOWER PLATTE NORTH NRD GROUND WATER STUDIES

1. Eastern Nebraska Water Resources Assessment (ENWRA)

Attached is ENWRA (Eastern Nebraska Water Resources Association) annual dues of \$30,000 and the second of the two-year agreement for GeoCloud of \$3,400.

Attached is a draft agreement to extend this for an additional 5 years plus other information. .

4. SURFACE WATER PROGRAMS

A. USGS STREAM FLOW GAUGING SITES

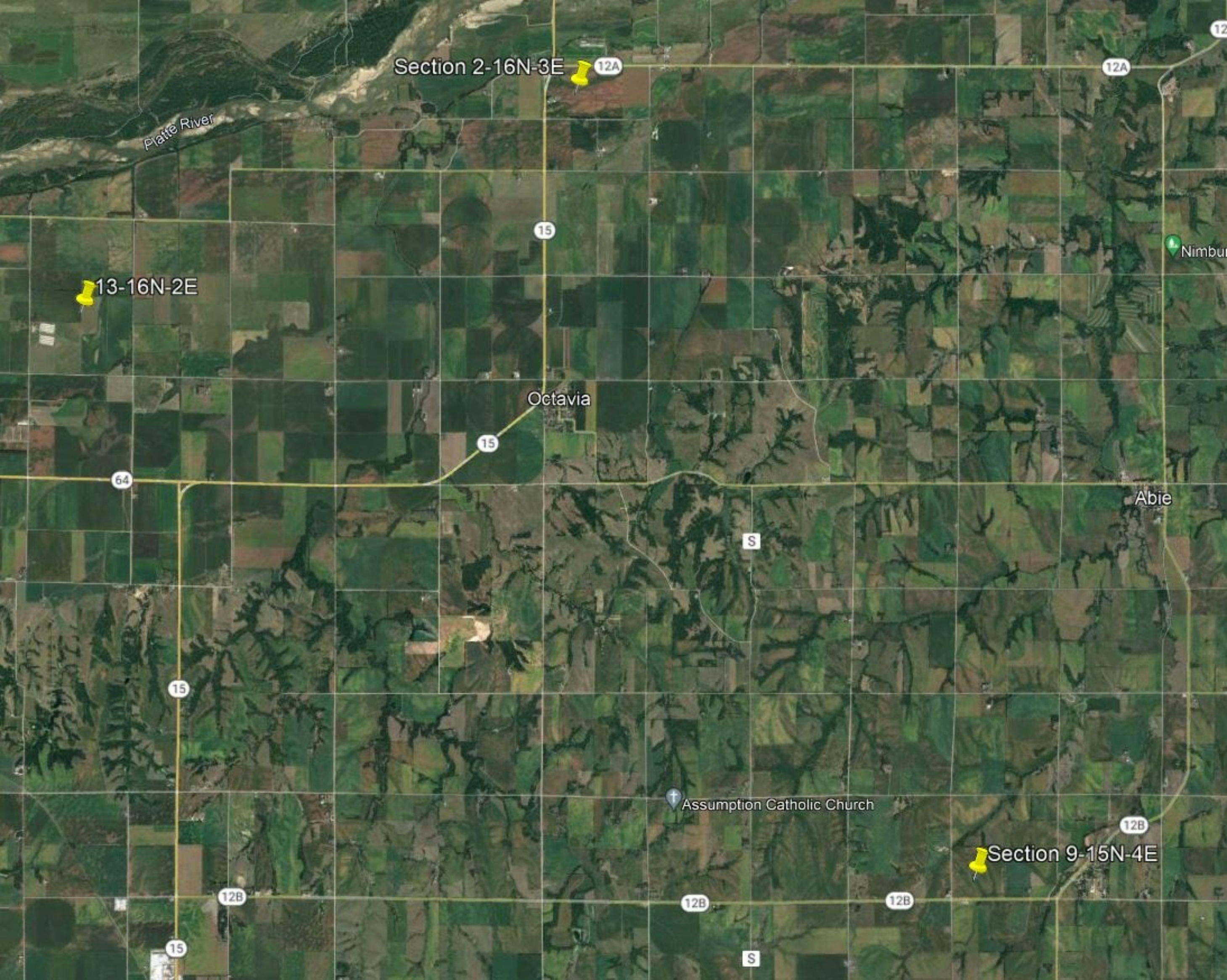
An invoice from LPS for \$6,562 for the water level and quality sampling gauge at Leshara. This is part of the agreement with USGS and the Corridor Alliance. This will be LPN final payment of the 3-year agreement. The Alliance and USGS would like to extend this for another 3 years.

Attached is a draft agreement for the next 3 years.

5. OTHER

Will's Report

A. COMMENTS FROM THE PUBLIC



Section 2-16N-3E

12A

12A

Platte River

15

Nimbur

13-16N-2E

Octavia

15

Abie

64

S

15

Assumption Catholic Church

12B

Section 9-15N-4E

12B

12B

12B

15

S



PRD

PRD

30th Rd

38

30th Rd

38

30th Rd

38

30th Rd

PRD

PRD

Road V-W

NE-12B

PRD

PRD

1st St

2nd St

3rd St

Bruno

4th St

5th St

37 Rd

37 Rd

128

37th Rd

37th Rd

I Want To...



Export To XLS



Export To PDF



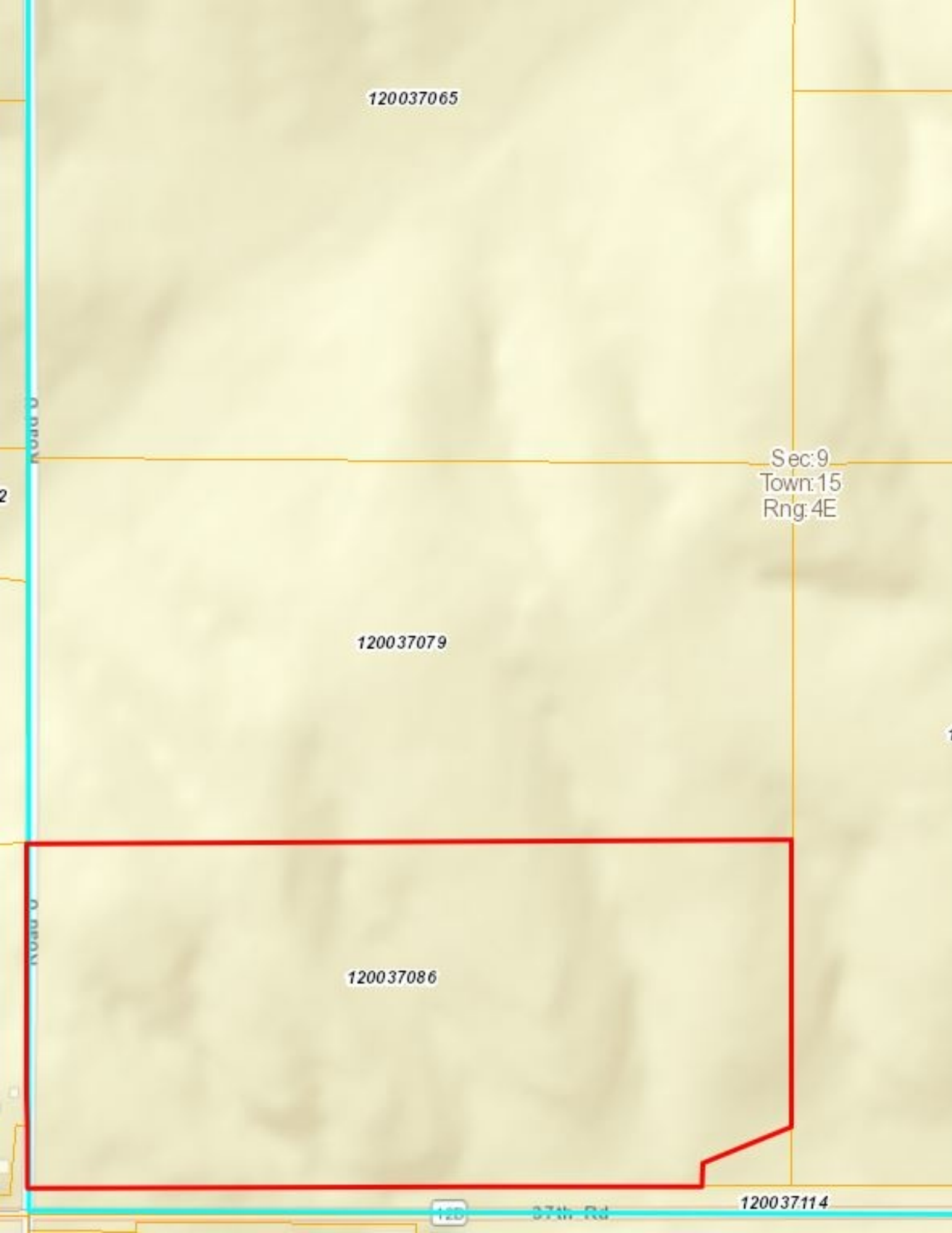
Show All Features

120047 Filter Results By

 Parcels (STR)

Parcels (STR) (8) ▲

▲ PID	OwnerName	PropertyAddress	OwnerAddress	LegalDesi
120043246	MASTNY, ANNETTE F	SAVANNAH	1390 42 RD BELLWOOD NE 68624	13-16-2 13 W1/2SE1/4 SE1/4SW1,
120043253	OSANTOWSKI, ERNEST J,FRANCES E & LEO J	SAVANNAH	981 43 1/2 RD BELLWOOD NE 68624	13-16-2 13 80 AC
120043260	MASTNY, ANNETTE F	SAVANNAH	1390 42 RD BELLWOOD NE 68624	13-16-2 13 E1/2SE1/4 120 AC
120043267	OSANTOWSKI, FRANCIS E	SAVANNAH	663 9TH AVE COLUMBUS NE 68601	13-16-2 13 AC
120043274	KOBZA, JOHN J & KIMBERLY L	SAVANNAH	4250 L RD BELLWOOD NE 68624	13-16-2 13 W1/2SW1/
120043275	KOBZA POULTRY LLC	4250 L BELLWOOD	4250 L ROAD BELLWOOD NE 68624	13-16-2 13 W1/2SW1/
120043281	KOBZA, JOHN J & KIMBERLY L	4250 L RD BELLWOOD	4250 L RD BELLWOOD NE 68624	13-16-2 13 W1/2SW1/
120043288	BREZINA FARMS INC	SAVANNAH	1510 44 1/2 RD BELLWOOD NE 68624	13-16-2 13 NE1/4SW1 SE1/4SW1,



Results

Details

I Want To...

[Show On Map](#)
[Export To PDF](#)
[Email Current PDF](#)

Butler Assessor Report

Parcel Information	
Parcel ID:	120037086
Map Number	N/A
State Geo Code	2693-09-3-00000-000-7086
Cadastral #	N/A
Images	
Current Owner:	YINDRICK/JAMIE A & CATHERINE A (CO TTEES JAMIE & CATHY YINDRICK FAMILY TR C/O GARY A & CHARLENE YINDRICK 3641 T ROAD DAVID CITY, NE 68632
Situs Address:	SKULL CREEK
Tax District:	256
School District:	DAVID CITY 56, 12-0056
Account Type:	Agricultural
Legal Description:	9 15 4 9 15 4 S1/2SW1/4 75.56 AC
Lot Width:	N/A
Lot Depth:	N/A
Total Lot	N/A

120



Road 45

12A

Road 45

Road 45

12A

Road 45

NE 15

O Rd

15

15

Road 44 1/2

Road 44 1/2

R Rd

R Rd

R Rd

O Rd

15

R Rd

			39070			
G-129574 WellID: 157793 LPN-004521 View Details View Scans	I I	Butler Lower Platte North 16N 3E 2 SENW 1778N 2293W Map It	4/7/2004 9/3/2004 10819510582409 3907004	153 350 gpm 9 ft --- PRO	--- --- 35 ft	David & Jerry Proskovec OwnerID: 78445 4470 Q Road Bellwood NE 68624
G-136646 WellID: 171308 LPN-005800 View Details View Scans	I I	Butler Lower Platte North 16N 3E 2 SWNW Map It 41°23' 26.400" -97°3' 25.000"	9/26/2005 10/3/2005 11280869467548 3907006	157 --- 18 ft --- PRO	--- --- 33 ft	Jerry Proskovec OwnerID: 76553 4470 County Road Q Bellwood NE 68624



Vadose Zone and Groundwater Nitrate Study

Lower Platte North Natural Resources District

Prepared for: Lower Platte North NRD

June 2021, Revised August 2021

By: Daniel Snow and Jessica Garcia Nascimento
University of Nebraska-Lincoln Water Sciences Laboratory



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Abbreviations

NRD	Natural Resources District
NO ₃ -N	Nitrate as nitrogen; specifically measures the amount of nitrogen in the nitrate ion in the sample
NH ₄ -N	Ammonia as nitrogen; specifically measures the amount of nitrogen in the ammonia ion in the sample
g	Gram; measures mass
mg	Milligram (1,000mg = 1g); measures mass
µg	Microgram (1,000,000 µg = 1g); measures mass
L	Liter; measures volume
mL	Milliliter (1,000mL = 1L); measures volume
g/cm ³	Grams per cubic centimeter (1 g/cm ³ = 1 g/mL); measures mass over volume, also known as density
mg/L	Milligrams per liter (1,000,000 mg/L = 1 g/cm ³ = 1 g/mL); measures mass over volume, also known as density
µg/g (ppm)	Microgram per gram and parts per million; measure mass over mass, also known as mass percent (1 µg/g = 1 ppm)
ng/g (ppb)	Nanograms per gram and parts per billion; measure mass over mass, also known as mass percent (1 ng/g = 1 ppb)
lbs-N/Acre-ft	Pounds nitrogen per acre-foot; measure weight nitrogen over volume soil (1 acre-ft = 1,233.48 m ³)

Definitions and calculations of parameters listed in vadose zone profile data

PARAMETER	CALCULATION
DEPTH	Start Depth - Stop Depth
GRAVIMETRIC WATER CONTENT	Water (g) / Dry Sample (g)
BULK DENSITY	Dry Sample (g) / Sample Volume (mL)
PH	Scale of 1 – 14
NO ₃ -N (µG/G)	(NO ₃ -N (mg/L) * L of Extract * 1000 µg) / sample weight (g)
NH ₄ -N (µG/G)	(NH ₄ -N (mg/L) * L of Extract * 1000 µg) / sample weight (g)
POREWATER NO ₃ -N (MG/L)	NO ₃ -N (µg/g) / Gravimetric Water Content
LBS-N/ACRE-FT	(NO ₃ -N (µg/g) * 2.2x10 ⁻⁹ (lb/µg) * Bulk Density (g/mL)) / 8.11x10 ⁻¹⁰ (Acre-ft/mL)
LITHOLOGIC DESCRIPTION	Sediment Type, Iron (Chemical or Physical), Organic Matter, Color
SAND %	(Sand (g) / Sample (g)) * 100
SILT %	(Silt (g) / Sample (g)) * 100
CLAY %	(Clay (g) / Sample (g)) * 100

Introduction

Nitrate-nitrogen (nitrate-N or $\text{NO}_3\text{-N}$) is the most common contaminant affecting aquifers worldwide^{1,3,4} and nonpoint source contamination of groundwater has been well documented for years^{2,3}. Nebraska has some of the most extensive groundwater quality records from across the country, and this rich dataset provides a useful source of information on land use practices that lead to a reduction in groundwater nitrate-N concentrations. Vadose zone monitoring has been conducted in many areas throughout the state to help assess the changing amount of nitrate-N stored in the unsaturated zone, associated transport rates, and potential for impacting groundwater $\text{NO}_3\text{-N}$ concentrations. Continued monitoring of this region between the crop root zone and the water table will help better assess when changing nutrient and irrigation practices are having an effect on nitrate loading. Repeated sampling over several years can help estimate the rate of travel and predict when and where nitrate stored in the vadose zone will intercept the water table, as well as provide insight to general concentrations of that nitrate in groundwater when it reaches the water table. This report describes a 2-year investigation of vadose zone and groundwater nitrate in the Lower Platte North Natural Resource District (LPNNRD) by the University of Nebraska between August 2019 to December 2020. The Lower Platte North and its contractor, EA Engineering, identified the area of interest, scheduled core and water samples collection, and delivered samples to the Water Sciences Laboratory. Additional data on groundwater nitrate levels in the district was provided to include with this report.

Objectives

The overall objectives of this project included:

1. Collect continuous cores, which are described and geologically classified, and chemically analyze composited subsamples every 2 to 5 feet.
 - a. Analyze core subsamples for gravimetric moisture content, bulk density, and pH.
 - b. Analyze selected core subsamples for nitrate isotopes, arsenic, and uranium and graph results to indicate changes in composition versus depth below surface.
 - c. Calculate the nitrate amount in the vadose zone by lbs/acre and at discrete depths.
 - d. Analyze selected subsamples for particle size analysis.
2. Estimate the vertical transit rate of water and nitrate at specific locations using data obtained from the vadose zone samples.
3. Analyze groundwater samples by the LPNNRD for nitrate isotopes, uranium, arsenic and summarize results in tabular or graphical format, providing some interpretation with respect to nitrogen sources and measured concentrations

Use of Nitrate Isotope Analysis

The stable isotope composition of nitrate can provide information about the predominant sources of nitrogen and whether nitrate has been affected by denitrification since formation in the soil. Nitrate is

composed of multiple stable isotopes of nitrogen and oxygen, and the composition or proportion of these isotopes changes in a predictable way in surface and groundwater systems. Moreover, nitrogen from specific sources has been shown to have a unique isotope composition or “fingerprint” which has led to several studies investigating the utility of linking nitrogen sources to nitrate contamination. Figure 1 illustrates ranges of the isotope composition of nitrogen sources (fertilizer, natural soil nitrogen, manure, and septic nitrogen) and the effect of denitrification on nitrate from a single source. Fractionation of the residual nitrate isotope composition during denitrification has been well documented [1] and must be considered when using nitrate isotope analysis for source determination. The stable isotope composition is measured and expressed as a delta “δ” per mil relative to a known reference standard using the following equation:

$$\delta(\text{‰}) = \frac{R_{\text{sample}} - R_{\text{standard}}}{R_{\text{standard}}} \times 1000$$

Where R_{sample} and R_{standard} are the ratios in heavy and light isotopes in a sample and reference standard. The reference standard for nitrogen isotope analysis is atmospheric nitrogen while the reference standard for oxygen isotope analysis is seawater. The use of atmospheric nitrogen as a reference standard is fortuitous for isotope fingerprinting because commercial nitrogen fertilizer is manufactured from the air.

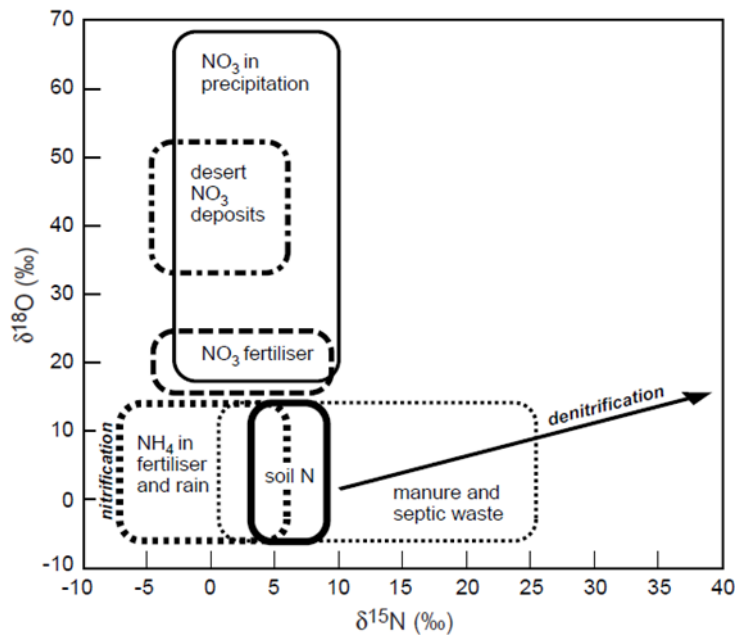


Figure 1. Typical ranges of delta 15N and delta18O of nitrate compared to different sources of nitrogen and the predicted effect from denitrification [1].

Measurement of both the nitrogen and oxygen isotope composition of nitrate allows better evaluation of the potential effect of $\delta^{15}\text{N-NO}_3$ enrichment due to denitrification assuming the original nitrogen isotope composition is in the range of commercial fertilizer nitrogen. As shown in Figure 1, the oxygen isotope and nitrogen isotope composition of nitrate affected by denitrification are predicted to increase in a straight line. If multiple samples plot along with a similar trend, then the enrichment is likely due to denitrification. A group of samples affected by denitrification will also show a negative slope in the plot of nitrate concentration versus $\delta^{15}\text{N-NO}_3$ content [1].

Area of Study

This report describes the investigation of vadose zone nitrate in the Bellwood Phase 2, Richland and Schuyler Phase 2 and 3 Groundwater Management Areas in the central region of the LPNNRD (Figure 2). The NRD instituted Phase 2 management near Bellwood in 2003, and Richland-Schuyler in 2004 in response to elevated nitrate levels in this region [2]. Parts of the Bellwood Phase 2 area were moved to Phase 1 in response to declining groundwater nitrate concentrations, while concentrations in the Richland-Schuyler Phase 2 and 3 areas continued to increase.

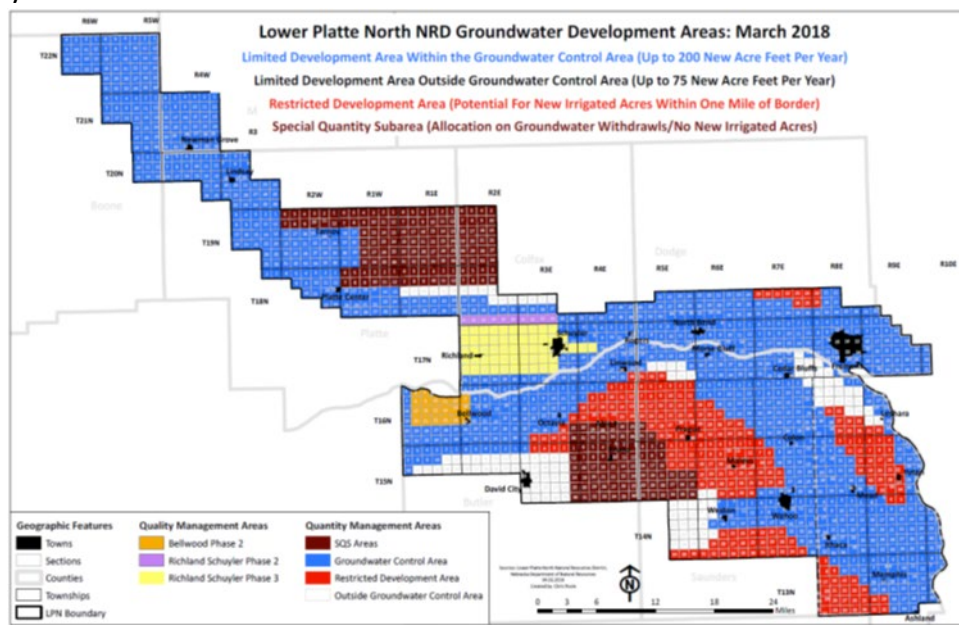


Figure 2. Locations of the Bellwood and Richland-Schuyler Groundwater Management areas included in this study [2]. Approximate location of vadose zone sampling outlined in yellow.

Geologic Setting. This region of the LPNNRD is located immediately downstream of the confluence of the Loup and Platte Rivers and groundwater contamination vulnerability (Figure 3) has been classified as “Group B” by [3]. The extent of nitrate contamination in Group B areas of Nebraska have increased by an average of 3330-3700 hectare per year (8230-9140 acres per year) as defined by median and maximum groundwater nitrate concentrations. In the LPNNRD, soil drainage is likely heterogeneous with a generally short distance to the water table in both well-drained and poorly drained soils. The shallow alluvial aquifer of these areas in Nebraska are mainly Quaternary sands and

gravels overlain by silty and sandy clay soils. The Platte River Valley at Schuyler contains a complex fill of alluvial and eolian sediments that overlie Cretaceous shale and limestones [4]. Alluvial floodplain deposits are bounded by terrace deposits (silts and clays interbedded with sands) and eolian loess (wind-blown silts) upland. Upland loess areas have a higher topographic relief and alluvial terrace and floodplain deposits. Group A areas are vulnerable to rapid nitrate leaching under aerobic conditions with little potential for denitrification. Group B, which includes this study, is characterized by well-drained silt loam soils with less rapid infiltration rates and, depending on conditions more potential for denitrification [3].

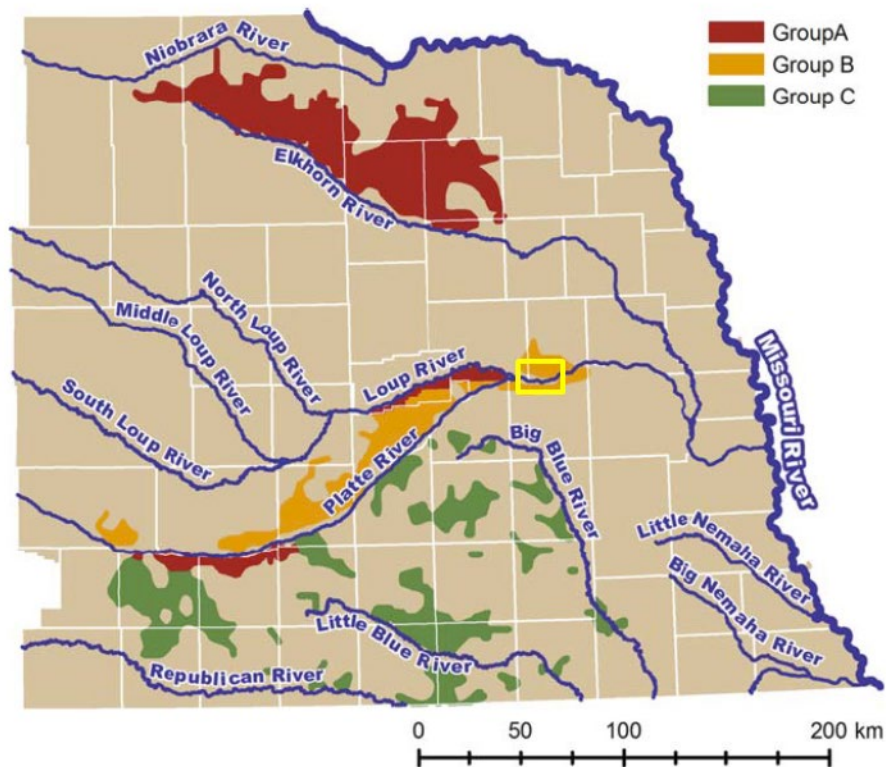


Figure 3. Groundwater nitrate-N vulnerability groups as defined by predominant irrigation, soil drainage characteristics, vadose zone thickness, and lithology [3]. The approximate location of the study area is indicated by a yellow rectangle.

Thirty (30) vadose zone core samples were collected by EA Engineering from areas used primarily for agricultural production (Table 1) and delivered to the Water Sciences Laboratory in November and December 2019. Figure 4 shows the location of 6 deep core samples (DS) and 24 shallow samples (SS), which were collected as representative samples. Deep sample sediments were cored from the surface to the water table wherever possible. Sampled vadose zone depths ranged from 15-77 feet below the land surface. Shallow representative samples were collected from 1-10 feet below the land

surface.

Table 1. Coring locations sampled in LPNNRD in 2019

No.	Site	Location	History	Irrigation method
1	DS-31-2019	41.4957127125; -97.1391908122	Corn	Center pivot
2	DS-32-2019	41.4634900506; -97.1917666978	Corn	Center pivot
3	DS-33-2019	41.4456590355; -97.2239917991	Corn	Center pivot
4	DS-35-2019	41.4962723661; -97.2487412702	Corn	Center pivot
5	DS-38-2019	41.4629776247; -97.2522929018	Soybeans	NA
6	DS-39-2019	41.478874804; -97.2522793081	Corn	Center pivot
7	SS-01-2019	41.4372847904; -97.0611142375	Turf	NA
8	SS-02-2019	41.4358855174; -97.0635670016	Turf	NA
9	SS-03-2019	41.4622279379; -97.0447318336	Corn	NA
10	SS-04-2019	41.4232678187; -97.0782114649	Alfalfa	NA
11	SS-05-2019	41.445203621; -97.2186696707	Cover Crop	NA
12	SS-07-2019	41.4280117969; -97.2146784713	Soybeans	NA
13	SS-08-2019	41.408970017; -97.2099130122	Grass	NA
14	SS-09-2019	41.4091315261; -97.2128628368	Sudan Grass, Cover Crop	NA
15	SS-10-2019	41.4196621992; -97.1941894434	Grass-old alfalfa	NA
16	SS-11-2019	41.4597987306; -97.179794079	Chopped Corn	NA
17	SS-13-2019	41.439027278; -97.0305036947	Corn	Center pivot
18	SS-14-2019	41.4236819596;	Sudan Grass, Cover Crop	Center pivot

		-97.0303969123		
19	SS-16-2019	41.4564356872; -97.082587755	Corn	Center pivot
20	SS-18A-2019	41.4521329645; -97.1092605075	Corn	Center pivot
21	SS-18B-2019	41.4520500324; -97.1160980092	Corn	Center pivot
22	SS-19-2019	41.4485025705; -97.1178774955	Corn	Center pivot
23	SS-26-2019	41.4277590942; -97.1878891794	Soybeans	Center pivot
24	SS-28-2019	41.4362040778; -97.1606532202	Corn	Gated pipe
25	SS-B01-2019	41.3804787998; -97.3409073198	Corn	Gated pipe
26	SS-B05-2019	41.3662898078; -97.3146470836	Native grass/pasture	
27	SS-B07-2019	41.3702383741; -97.2921133047	Corn	Center pivot
28	SS-B11-2019	41.3522055985; -97.3301626991	Alfalfa	Center pivot
29	SS-B16-2019	41.3778599083; -97.2466730413	Corn	Gated pipe
30	SS-B22-2019	41.3395186353; -97.2489222598	Soybeans	Gated pipe

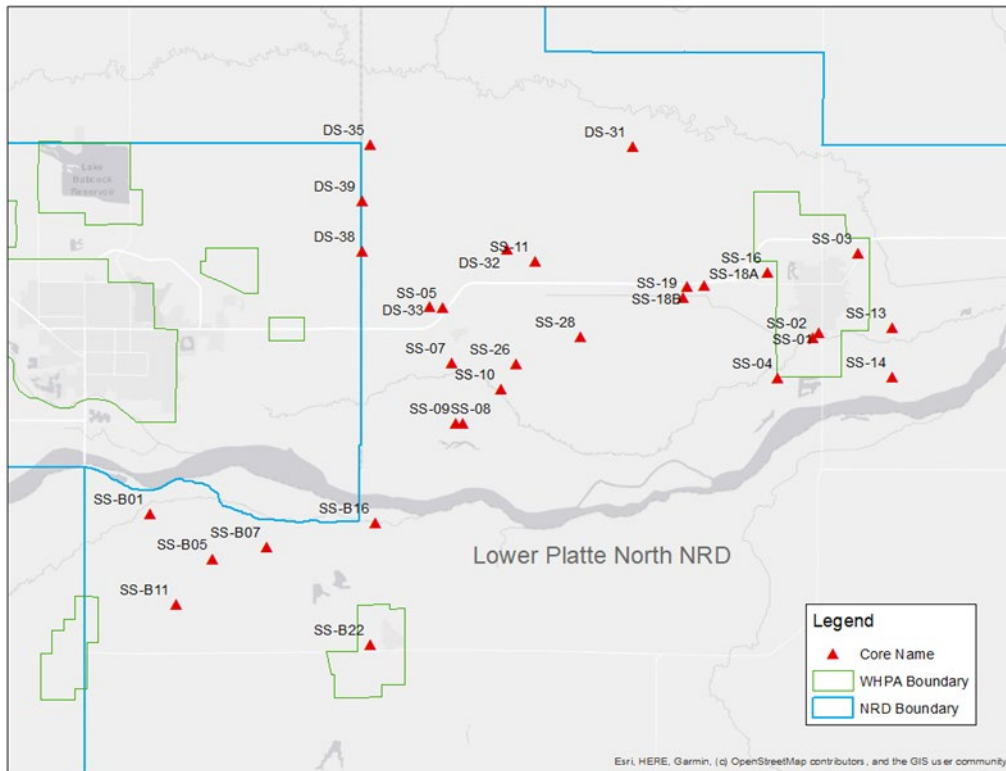


Figure 4. Location of vadose zone soil sampling sites in LPNNRD collected by EA Engineering in 2019.

Field and Laboratory Methods

Core Collection and Processing

To complete Objective 2, core samples were collected by EA Engineering using standard field collection methods associated with direct-push sampling of unconsolidated materials. Delivered cores and grab samples processed using standardized vadose zone sampling methods at the Water Sciences Laboratory. All cores were stored frozen at -20°C until they could be sectioned, described, and composited for the analytical methods described below.

Nitrate, Arsenic, Uranium and Nitrate Isotope Analysis

In the laboratory, core sections were removed from the freezer and allowed to partially defrost. Cores were divided into 2-foot intervals for compositing, though shorter intervals were used where there was a visible change in lithology. For each subsample, a portion of the core that was representative of the entire sample was separated and returned to the freezer. Out of this remainder, a portion of fresh sample was taken for measurement of bulk density and water content by weighing a known volume, oven drying the sample for 24 hours at 105°C , and then reweighing the sample. The difference in weight represented the water content, which can be divided by the moist sample to determine gravimetric water content. The remaining moist sample was homogenized and left to air dry overnight. The following day the air

dried soil was ground using a mortar and pestle or Wiley Mill. Approximately 15 grams of each ground subsample was taken for particle analysis. Five grams were mixed with 5 mL of purified water to measure sediment pH. Ten grams were mixed with a 1M KCl solution and loaded on a wrist action shaker for one hour to extract NO₃-N and NH₄-N. Extracts were preserved with sulfuric acid and batched for colorimetric analysis on a Lachat Quikchem 8500 flow injection autoanalyzer. The quality of the analytical results were checked by analysis of method blanks, fortified blanks and duplicates. A standard test soil was also extracted and analyzed with each batch of twenty samples. The results of the quality controls are summarized in Appendix 3. Calculations used for the final results are summarized in the beginning of the report under Abbreviations section.

Composites from two cores (SS-11 and DS-38) were selected for characterization of acid leachable arsenic and uranium concentrations using microwave assisted acid digestion and inductively coupled plasma mass spectrometry (ICP-MS). Selected samples with elevated nitrate concentrations were reextracted with 1M KCl and analyzed for nitrate isotopes using the azide method [5]. The azide reduction process uses a two-step chemical conversion involving alkaline Cd-reduction of dissolved nitrate to nitrite, followed by an acidic reaction of nitrite with azide to produce nitrous oxide (N₂O). N₂O is purged and cryogenically trapped on an Isoprime Tracegas pre concentrator interfaced with a GVI Isoprime isotope ratio mass spectrometer. Trapped N₂O is chromatographically separated from nitrogen gas, and ions with m/z =44, 45, and 46 are simultaneously separate and monitored on a multi-collector magnetic sector mass spectrometer. Standard nitrate solutions from known, isotopically-characterized nitrate are processed and analyzed in the same way as samples, and the results are used for calibrating the mass spectrometer.

Groundwater samples collected by LNNRD staff were analyzed for arsenic, uranium, nitrate, and nitrate isotopes. Arsenic and uranium concentrations were determined by ICP-MS using a Thermo ICAP RQ inductively coupled plasma mass spectrometer. Nitrate concentrations were determined by automated Cd-reduction [6] using a Seal AQ2 autoanalyzer. Nitrate isotopes were determined using the azide reduction method [5], similar to the procedure described for soil extracts. Laboratory quality controls for all methods included analysis of laboratory method blanks, fortified blanks, fortified matrix samples and duplicates each analyzed at a rate of 5%.

Additional nitrate-N measurements for 2019 and 2020 were made available by the LPNNRD to be included in this report and help to determine spatial trends in nitrate concentrations throughout the district.

Results

A summary of the processing timeline for nitrate-N, ammonia-N, pH, moisture, and textural analysis is provided in Table 2. Calculations for each parameter are listed in the Abbreviations section of this report and a summary of the average results for each core is provided in Table 3. Graphs of nitrate-N, ammonia-

N, gravimetric moisture content, and porewater equivalent nitrate-N concentrations measured for each core are provided in Appendix 1.

Table 2. Vadose zone soil cores summary of characteristics and processing timeline.

No.	Site	Sampled	Extracted	Water Table (ft)	Total Depth (ft)
1	DS-31-2019	12/10/2019	2/21/2020		77
2	DS-32-2019	12/10/2019	2/21/2020	49	45
3	DS-33-2019	12/9/2019	4/16/2018	13	15
4	DS-35-2019	12/10/2019	2/14/2020	63	60
5	DS-38-2019	12/9/2019	2/28/2020	63	65
6	DS-39-2019	12/9/2019	3/6/2020	75	65
7	SS-01-2019	11/19/2019	2/5/2020	--	6.5
8	SS-02-2019	11/19/2019	2/5/2020	--	6
9	SS-03-2019	11/19/2019	2/5/2020	--	7
10	SS-04-2019	11/19/2019	2/5/2020	--	6.5
11	SS-05-2019	11/19/2019	2/7/2020	--	9
12	SS-07-2019	11/25/2019	1/24/2020	--	4.5
13	SS-08-2019	11/19/2019	2/7/2020	--	2.5
14	SS-09-2019	11/19/2019	2/7/2020	--	1
15	SS-10-2019	11/19/2019	2/7/2020	--	7.5
16	SS-11-2019	11/19/2019	2/7/2020	--	10
17	SS-13-2019	11/25/2019	1/24/2020	--	7.5
18	SS-14-2019	11/25/2019	1/28/2020	--	4.5
19	SS-16-2019	11/25/2019	1/24/2020	--	6
20	SS-18A-2019	11/25/2019	1/24/2020	--	3.5
21	SS-18B-2019	11/25/2019	1/24/2020	--	3
22	SS-19-2019	11/25/2019	1/24/2020	--	4
23	SS-26-2019	11/25/2019	1/24/2020	--	3.5
24	SS-28-2019	11/25/2019	1/24/2020	--	4
25	SS-B01-2019	11/26/2019	1/30/2020	--	7.5
26	SS-B05-2019	11/26/2019	1/30/2020	--	1
27	SS-B07-2019	11/26/2019	1/30/2020	--	4
28	SS-B11-2019	11/26/2019	1/30/2020	--	8
29	SS-B16-2019	11/25/2019	1/28/2020	--	9.5
30	SS-B22-2019	11/25/2019	1/28/2020	--	10

Table 3. Deep vadose zone soil cores averages

Site	Bulk Density (g/cm ³)	Gravimetric Water Content (g/g dry sed)	pH	NH ₄ -N (µg/g)	NO ₃ -N (µg/g)	Pore Water NO ₃ -N (mg/L)	Soil NO ₃ -N (lbs- N/Acre-Ft)	Total Soil NO ₃ -N (lbs-N/acre)
DS-31-2019	0.89	0.08	8.30	0.45	0.52	8.82	1.19	19.0
DS-32-2019	0.85	0.09	8.45	0.45	1.23	14.87	3.13	28.0
DS-33-2019	1.08	0.17	6.92	0.46	6.69	42.55	19.76	59.0
DS-35-2019	0.89	0.10	8.60	0.49	3.11	41.38	7.17	93.0
DS-38-2019	0.89	0.12	8.52	0.50	3.17	16.75	7.36	96.0
DS-39-2019	0.86	0.10	8.40	0.57	1.35	27.25	3.12	41.0
Average	0.91	0.11	8.20	0.49	2.68	25.27	6.96	56.0

Table 4. Shallow vadose zone sample averages

Site	Gravimetric Water Content (g/g dry sed)	pH	NH ₄ -N (µg/g)	NO ₃ -N (µg/g)	Pore Water NO ₃ -N (mg/L)
SS-01-2019	0.09	8.01	0.84	0.36	6.08
SS-02-2019	0.19	7.87	0.95	0.82	3.44
SS-03-2019	0.11	7.82	1.41	0.72	5.66
SS-04-2019	0.16	7.87	1.18	1.02	5.83
SS-05-2019	0.05	6.84	0.60	0.21	4.43
SS-07-2019	0.14	7.42	0.87	3.05	20.47
SS-08-2019	0.21	8.20	0.83	1.02	4.68
SS-09-2019	0.20	7.96	1.94	1.86	9.38
SS-10-2019	0.12	6.79	1.63	0.32	2.83
SS-11-2019	0.14	6.68	1.46	61.77	499.01
SS-13-2019	0.12	8.28	0.97	3.70	27.78
SS-14-2019	0.16	7.84	0.88	3.68	23.33
SS-16-2019	0.11	8.47	1.13	5.05	51.86
SS-18A-2019	0.18	7.9	2.37	8.71	47.57
SS-18B-2019	0.28	7.87	2.20	4.40	15.87
SS-19-2019	0.42	7.63	2.46	3.31	7.80
SS-26-2019	0.19	7.25	0.66	3.84	20.35
SS-28-2019	0.13	7.92	1.89	2.74	20.53
SS-B01-2019	0.10	8.02	1.39	12.91	125.16

SS-B05-2019	0.16	8.17	2.70	1.92	11.95
SS-B07-2019	0.24	8.42	5.51	4.35	17.79
SS-B11-2019	0.06	7.33	1.30	0.75	18.34
SS-B16-2019	0.10	7.77	0.46	5.47	58.87
SS-B22-2019	0.19	7.70	0.42	3.09	17.31
Average	0.16	7.75	1.50	5.63	42.76

Discussion

Six deep vadose zone cores were collected from the northern portion of the study area (Figure 1). Individual profiles for these cores are included in the Appendix 1 and a summary of the averages is showed in Table 3. Locations DS-31, DS-32, DS-33, DS-35, and DS-39 are all described as pivot-irrigated corn, while DS-38 land use is soybean (Table 1). Shallow samples were collected from grass, corn, and soybean cropland irrigated and non-irrigated (Table 1). The average deep vadose zone nitrate ranged from 0.52 at location DS-31 to 6.69 $\mu\text{g/g}$ at DS-33 and when expressed as pore water range from 8.82 to 42.5 mg/L $\text{NO}_3\text{-N}$, respectively. Pore water nitrate is calculated by multiplying the measured dry weight nitrate-N by the gravimetric moisture content, and provides a direct comparison to groundwater nitrate-N concentrations in mg/L. The depth profile at DS-31 shows relatively low moisture content, and uniformly low nitrate concentrations below 10' suggesting little accumulation in these sandy loam sediments. The water table at core DS-33 was intercepted at 13 feet below the surface and resulted in only 3 composite samples in organic-rich clay and loamy sand sediments (Figure A3). Porewater nitrate increased with depth to approximately 52 mg/L near the water table. The profile at location DS-38 (Figure A5, soybean crop) indicates a distinct peak in sediment and porewater nitrate concentrations (reaching 20 $\mu\text{g/g}$ and over 80 mg/L respectively) at approximately 15 feet below the surface. Average vadose zone nitrate-N at these locations range from 1.19 to 19.76 lbs-N/acre-ft (Table 3) and total stored nitrate-N ranged from 19 to 96 lbs N/acre.

Shallow soil cores, drilled to a depth of up to 10 feet, were collected from a larger area and help to characterize surface inputs to vadose zone nitrate. Average sediment nitrate-N in the shallow vadose soil samples ranged from 0.21 to 61.77 $\mu\text{g/g}$, with an overall average of 5.63 $\mu\text{g/g}$ (Table 4). Because the majority of these samples are within or just below the crop root zone, this nitrate source may be available for plant uptake during subsequent crop years. Averaging dry weight and porewater nitrate concentrations for each reported land use show that nitrate concentrations are roughly 3 times higher beneath corn than under soybean, and approximately 5 times higher than alfalfa or grass/cover crops (Figure 5). Ammonia-N concentrations in the shallow core samples are generally higher than in the deep vadose cores averaging 0.42 to 5.51 $\mu\text{g/g}$ compared to a range of 0.45 to 0.57 in deep vadose zone core samples. Only a single sample was collected at several locations, including SS-09, SS-18A, SS-19, SS-26, SS-28, and SS-B05.

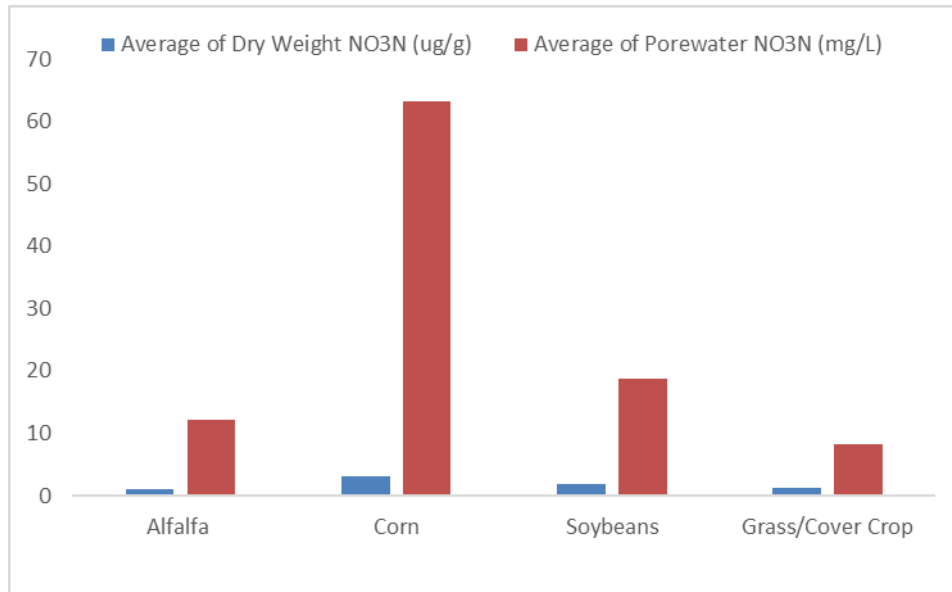


Figure 5. Comparison of average dry weight nitrate and porewater nitrate concentrations by reported land use.

Vadose Zone Arsenic and Uranium

Cores SS-11 and DS-38 were selected for characterization of acid-leachable arsenic and uranium concentrations to evaluate these sediments as a source of geogenic contaminants to groundwater. Arsenic concentrations range from 0.46 to 8.98 $\mu\text{g/g}$ at both locations, while uranium concentrations range from 0.17 to 1.44 $\mu\text{g/g}$ (Appendix 2). Concentrations are at a maximum in the near surface samples suggesting a possible association with finer textured soil. Mean uranium concentrations in surface (0-2") soils are reported to be in the range of 2-3 $\mu\text{g/g}$, while arsenic concentrations are reported to average near 7-8 $\mu\text{g/g}$ in this area [7]. Depending on the form of arsenic and uranium in surface soils, these trace elements be leached into the water table.

Groundwater Samples

Thirty-one groundwater samples were collected by the LPNNRD staff during the summer and fall of 2019 and 2020. These were processed and analyzed for dissolved arsenic, uranium, nitrate-N, and nitrate isotopes. Results for arsenic and uranium are presented in Table 5 together with the USEPA maximum contaminant levels for public drinking water systems. Arsenic concentrations averaged 4.2 \pm 4.2 $\mu\text{g/L}$ and were below the maximum contaminant level in all but 2 samples (Table 5). Uranium concentrations averaged 12 \pm 10 $\mu\text{g/L}$ and exceeded the USEPA maximum contaminant level in 1 sample.

Table 5. Results of groundwater arsenic and uranium concentrations.

Sample_ID	Collection Date	Arsenic (ug/L)	Uranium (ug/L)
USEPA Drinking Water Standards (µg/L)		10.0	30.0
BSE23-16-1	7/17/2019	4.76	7.81
G-002937	7/18/2019	2.41	4.50
G-006771R	7/29/2019	4.72	7.79
G-046365	7/29/2019	3.94	12.77
G-004887	7/29/2019	3.00	4.08
G-055480A	7/30/2019	3.17	1.85
G-136580A	7/31/2019	1.00	0.11
SW5219W	8/6/2019	2.78	3.77
SW4819W	8/6/2019	3.39	7.25
G-001739	8/8/2019	3.13	5.77
G-020497	9/3/2019	2.30	6.22
G-113877	9/3/2019	2.73	0.15
G-001817	7/24/2020	4.14	17.56
G-004315	7/24/2020	2.16	6.03
G-002068	7/24/2020	3.58	18.00
G-122133	7/27/2020	19.67	22.85
G-068733	7/27/2020	4.57	23.87
G-014893	7/27/2020	2.25	6.33
G-026576	7/28/2020	2.04	14.52
G-007336	7/30/2020	1.86	18.53
G-004966	8/4/2020	2.69	4.72
G-046365	8/12/2020	3.76	20.56
G-002068	8/13/2020	3.49	20.71
G-068733	8/20/2020	4.96	21.60
G-004315	8/20/2020	2.08	5.70
G-014893	8/21/2020	2.36	6.74
G-001817	8/26/2020	4.28	19.14
G-122133	8/26/2020	19.56	22.53
G-076286	9/1/2020	4.33	49.07
G-011527	9/1/2020	4.72	15.16
G-135549	9/2/2020	0.84	1.68

Spatial Distribution of Groundwater Nitrate

Roughly 480 sample results for groundwater nitrate were supplied for this report and used to generate a map of the overall nitrate distribution (Figure 6) and comparison to the area of the vadose zone

investigation (Figure 6). Approximately half of the samples were collected by NRD staff and the rest by producers. The distribution suggests that the current area of interest is most highly affected by elevated groundwater nitrate. Groundwater nitrate from samples across the district averages 10.6 ± 8.2 mg/L, with the highest concentration near 60 mg/L. Within the study area (Figure 7), nitrate-N concentrations average 12.4 ± 8.0 mg/L.

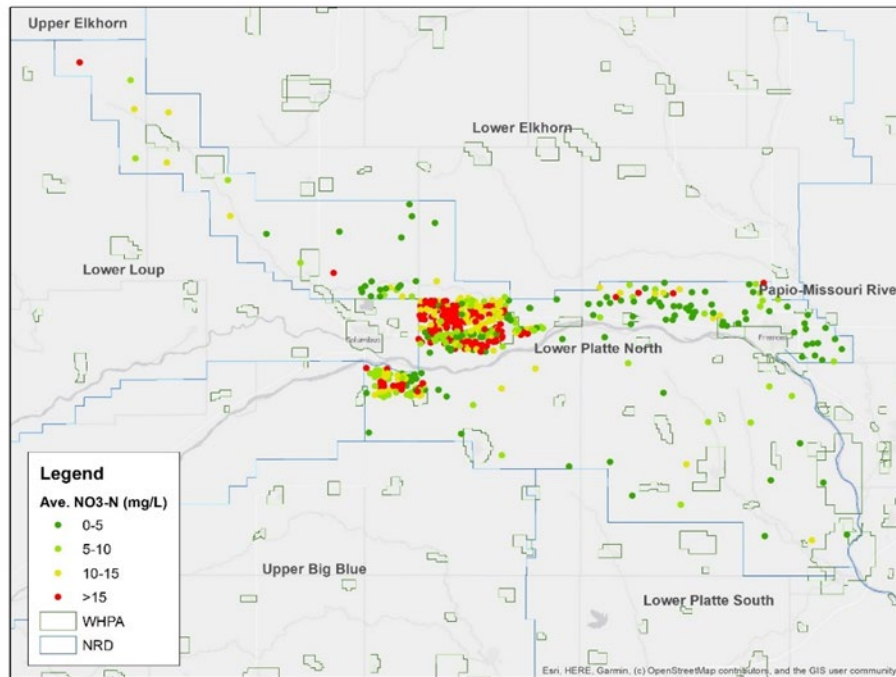


Figure 6. Overall distribution of nitrate-N concentrations in groundwater samples collected by NRD staff and producers in 2019 and 2020.

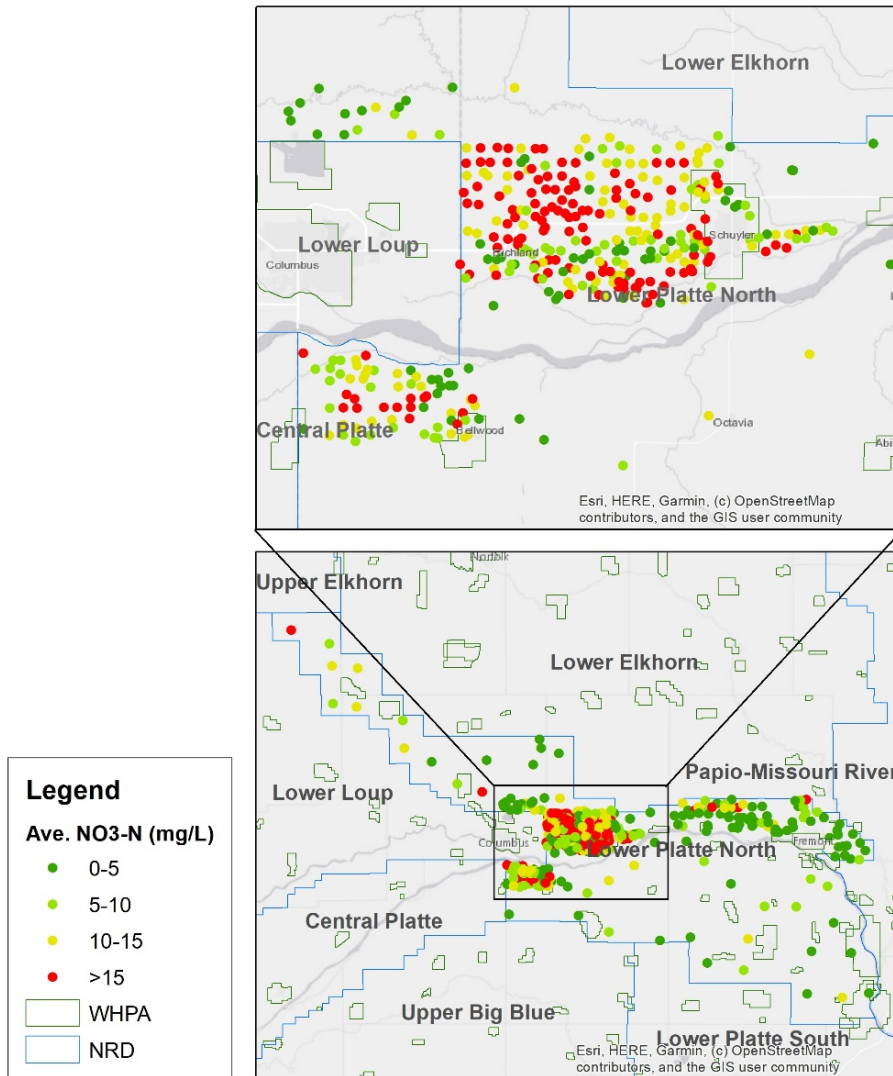


Figure 7. Distribution of groundwater nitrate-N concentrations based on data supplied by the LPNNRD in the present study area (upper map) and across the district.

Nitrate Isotope Trends from Study Area

Table 6 Summarizes the well water sample nitrate concentrations are summarized together with the nitrogen isotope composition. Nitrate-N concentrations averaged 16.7(±11.4) mg/L while the $\delta^{15}\text{N-NO}_3$ and $\delta^{18}\text{O-NO}_3$ composition averaged +5.59 ‰ and +5.97‰ respectively.

Table 6. Summary of nitrate concentrations and isotope composition from the study area.

Sample ID	Collection Date	NO3-N (mg/L)	$\delta^{15}\text{N-NO}_3$ (‰)	$\delta^{18}\text{O-NO}_3$ (‰)
BSE23-16-1	7/17/2019	9.21	5.85	18.56
G-002937	7/18/2019	48.35	8.52	13.75
G-004887	7/29/2019	31.73	+6.61	+0.29
G-046365	7/29/2019	16.73	+2.61	+2.29
G-055480I	7/30/2019	18.27	+4.31	+1.91
G-136580I	7/31/2019	28.01	+3.91	+4.30
SW5219W	8/6/2019	9.57	+4.70	+1.56
SW4819W	8/6/2019	8.62	+5.30	-0.81
G-001739	8/8/2019	10.50	+6.57	+7.94
G-020497	9/3/2019	10.89	+9.16	+6.52
G-026329	9/3/2019	0.03	+6.49	+4.40
G-026328	9/3/2019	30.73	+5.11	+8.30
G-026576	7/28/2020	32.38	+4.73	+5.95
G-007336	7/30/2020	11.37	+4.08	+3.95
G-004966	8/4/2020	17.12	+6.34	+4.45
G-046365	8/12/2020	13.75	+5.03	+4.82
G-002068	8/13/2020	14.96	+8.57	+6.41
G-068733	8/20/2020	10.26	+8.50	+10.37
G-004315	8/20/2020	27.19	+8.50	+3.77
G-014893	8/21/2020	24.45	+5.09	+4.11
G-001817	8/26/2020	12.35	+3.93	+5.63
G-122133	8/26/2020	15.58	+3.01	+5.94
G-076286	9/1/2020	13.21	-0.89	+3.33
G-011527	9/1/2020	0.62	+11.50	+13.52
G-135549	9/2/2020	0.32	+2.20	+7.91
Average		16.65	+5.59	+5.97
Std Deviation		11.43	2.63	4.40

A graph of nitrate-N concentrations versus $\delta^{15}\text{N-NO}_3$ (Figure 8) shows no significant correlation in these wells. Comparing the ranges of $\delta^{15}\text{N-NO}_3$ and $\delta^{18}\text{O-NO}_3$ for these samples to typical ranges shown in Figure 1 suggests that about half have nitrogen isotope composition characteristic of nitrogen from commercial fertilizers while the remaining are a mixture of organic nitrogen sources (manure or septic systems) and fertilizer nitrogen (Figure 8). One sample was found to plot in the range for nitrate fertilizer and six fall in the range characteristic of nitrogen from organic nitrogen sources such as manure. These $\delta^{15}\text{N}$ enriched nitrate samples also show a predictable increase in $\delta^{18}\text{O-NO}_3$ expected from denitrification of nitrate. Based on this trend, denitrification likely has affected groundwater nitrate in these samples. Plots of the $\delta^{15}\text{N}$ versus the inverse and natural log of nitrate-N concentrations show evidence of both mixing and denitrification.



Figure 8. Relationship between well water nitrate concentrations and $\delta^{15}\text{N-NO}_3$ composition.

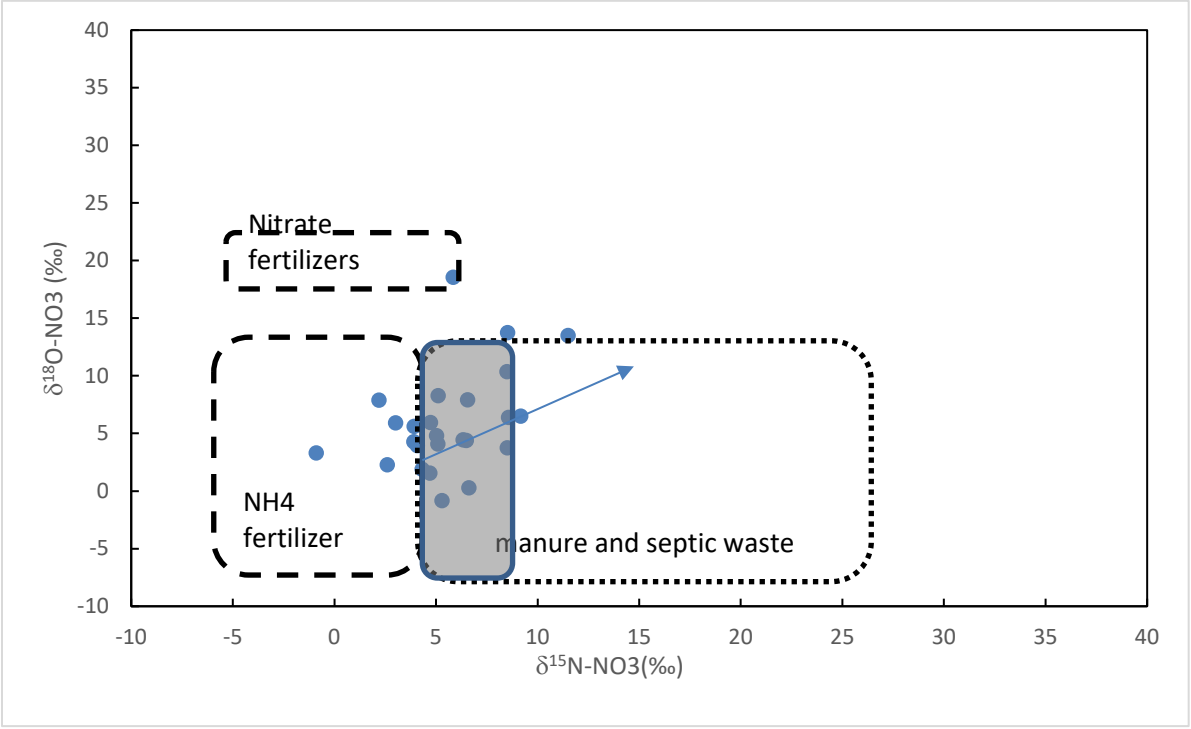


Figure 9. Variation of well water nitrogen and oxygen isotope composition compared to ranges for different nitrogen sources shown in Figure 3. Grey area represents the range for soil nitrogen and mixed sources of inorganic and organic nitrogen sources, and the arrow shows the expected trend from denitrification.

Six grab samples of groundwater at the water table were collected during vadose zone coring and analyzed for nitrate concentrations and nitrate isotope composition. Table 7 summarizes the results of these samples with nitrate concentrations that ranges up to 125 mg/L. Nitrate isotope composition at the water table is comparable to the isotope composition from the wells in this area with most characteristic of commercial fertilizer nitrogen.

Table 7. Summary of nitrate concentrations and nitrate isotope composition of grab samples collected during coring of DS-32, 33, 34, 35, 38, 39, and 54.

Sample ID	Collection Date	Nitrate-N (mg/L)	$^{15}\text{N-NO}_3$ (‰)	$^{18}\text{O-NO}_3$ (‰)
DS-33-13	12/11/2019	122.27	+1.55	+0.80
DS-54-13	12/11/2019	125.03	+3.73	+4.73
DS-35-63	12/11/2019	100.64	+8.18	+8.05
DS-38-63	12/11/2019	5.76	+9.03	+6.31
DS-39-75	12/11/2019	36.68	+6.29	+6.05
DS-32-49	12/11/2019	91.65	+12.53	+6.80

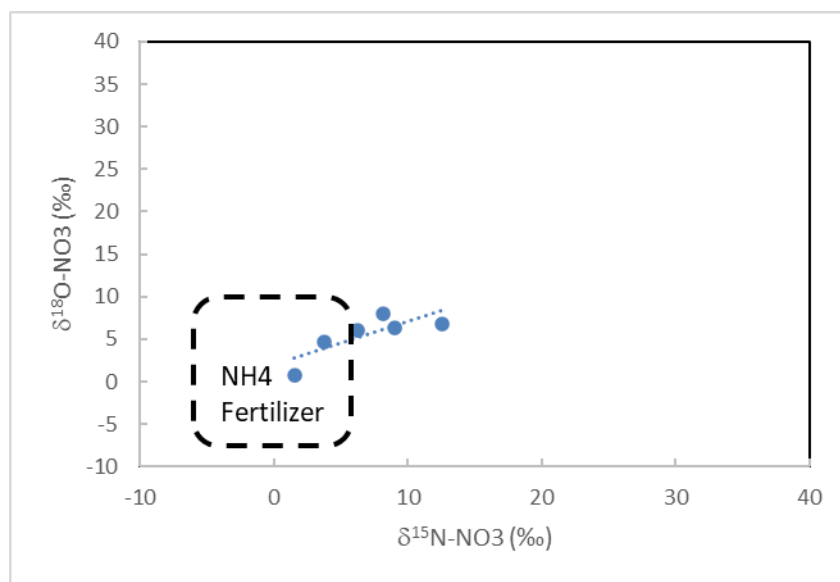


Figure 10. Variation of nitrate isotope composition in grab samples collected at the water table at vadose cores DS-32, 33, 35, 38, 39, and 54. The trend line is a liner regression plot.

Figure 10 shows that nitrate isotope composition for the grab samples from these locations follow the expected trend for denitrification at these sites. Extracts of core samples from two locations (SS-11 and DS-38) were analyzed for also nitrate isotope composition and the results are summarized in Table 8.

Soil extracts from location SS-11 show slightly enriched $\delta^{15}\text{N-NO}_3$ characteristic of a mixed source while those from DS-38 all fall in the range of a commercial fertilizer nitrogen source with no evidence for denitrification within each core (Table 8). Both locations show higher levels of nitrate concentrations in the top 10-15 of the vadose zone.

The distribution of the $^{15}\text{N-NO}_3$ composition is shown in Figure 11. The majority of samples are consistent with a source of commercial nitrate, ranging between -5 and +5 ‰. One sample well G-011527, collected in the northeastern corner of the study area is +11.5‰ but this same sample has a very low nitrate concentration (0.62 mg/L), and is most likely enriched from denitrification. While livestock manure application may affect total nitrogen application across this study area, these results suggest that long term overapplication of commercial fertilizer has provided the source of nitrogen.

Table 8. Summary of nitrate concentrations and nitrate isotope results for cores SS-11 and DS-38.

Sample ID	Collection Date	NO_3N ($\mu\text{g/g}$)	$\delta^{15}\text{N-NO}_3\text{N}$ (‰)	$\delta^{18}\text{O-NO}_3$ (‰)
SS-11-0-4	11/19/2019	34.0	+9.07	+10.71
SS-11-4-5.5	11/19/2019	115.0	+6.49	+10.98
SS-11-5.5-10.5	11/19/2019	36.3	+9.34	+11.67
EA115-38-5	3/11/2020	1.94	+2.63	+10.65
EA116-38-10	3/11/2020	11.58	+3.97	+15.14
EA117-38-14	3/11/2020	20.04	+2.37	+10.58
EA118-38-20	3/11/2020	4.82	+2.48	+6.97
EA119-38-25	3/11/2020	0.37	-5.83	+2.94
EA120-38-30	3/11/2020	0.33	+0.66	+12.40
EA121-38-35	3/11/2020	0.26	+0.14	+14.49
EA122-38-40	3/11/2020	0.41	+1.28	+12.37
EA123-38-45	3/11/2020	0.25	+0.01	+8.51
EA124-38-50	3/11/2020	0.36	+1.10	+12.34
EA125-38-55	3/11/2020	0.25	+0.19	+11.91
EA126-38-60	3/11/2020	0.23	+0.13	+12.02
EA127-38-65	3/11/2020	0.37	+2.19	+10.25

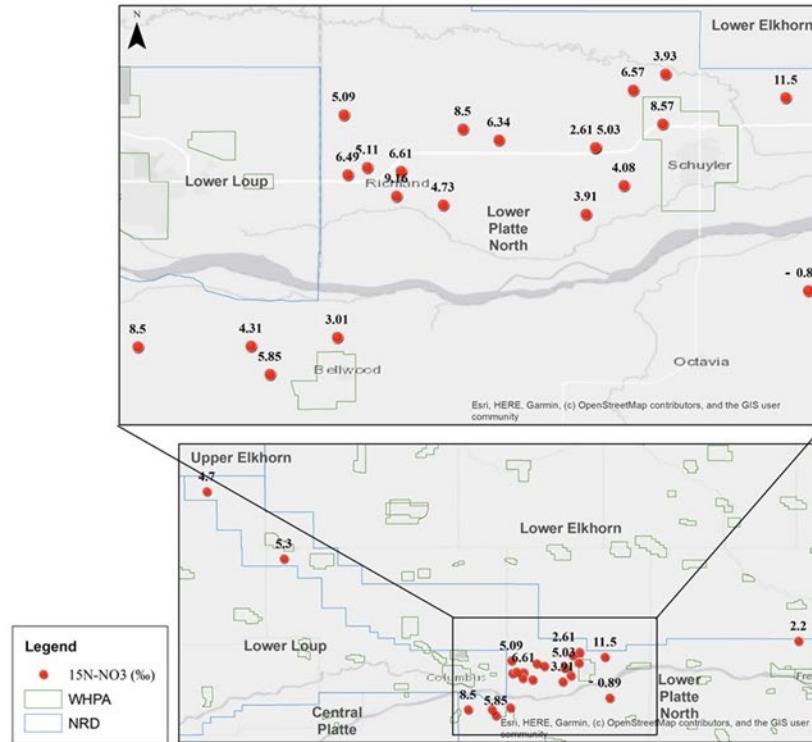


Figure 11. Distribution of 15N-nitrate isotope composition in all groundwater samples collected for this study.

Conclusions

Based on the trends of groundwater and vadose zone nitrate levels in this area of the LPNNRD, there is clearly continued loading of nitrate to the water table. The Bellwood Phase 2, Richland and Schuyler Phase 2 and 3 Groundwater Management Areas have some of the highest groundwater nitrate concentrations of the district. Analysis of six deep vadose zone samples shows pore water nitrate concentrations with location averages ranging 8.82 from 42.55 mg/L, similar to local groundwater concentrations. Vadose zone nitrate was highest beneath cropland with continuous corn and soybeans, while alfalfa, grass, and cover crops had much lower nitrate levels. Except for 2 wells, arsenic and uranium concentrations in groundwater samples were generally below the maximum contaminant level for drinking water. Stable isotope analysis of nitrate in the groundwater and vadose zone samples indicates over half of nitrate nitrogen is likely from the overapplication of commercial fertilizer. Several samples show evidence of enrichment by denitrification, especially grab samples taken near the water table, and several have nitrogen isotope composition characteristic of a mixture of organic (manure) nitrogen and commercial fertilizer. Comparison of sites with enriched nitrogen to manure application can help confirm the importance of this source. The majority of samples, however, have nitrogen isotope composition similar to commercial (inorganic) nitrogen, and thus efforts to limit the application of fertilizer is

recommended. Future vadose zone and groundwater sampling in these areas will provide information on the effectiveness of any changes in nutrient management practices.

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Quality Assurance Objectives

The results of quality control samples analyzed for this project are summarized in Appendix 3. One of the objectives of this project is to develop a set of protocols that can be used to help standardize coring, measurement, organization, and presentation of the information collected from vadose zone monitoring projects. A list of the standard operating procedures used in this project is provided in Appendix 3. The intention is to both improve and simplify the data collection over time and areas so that results will be comparable and trends can be better identified.

Appendix 1: Graphs of Results by Core

DS-31-2019

Total N load= 19 lbs-N/Acre

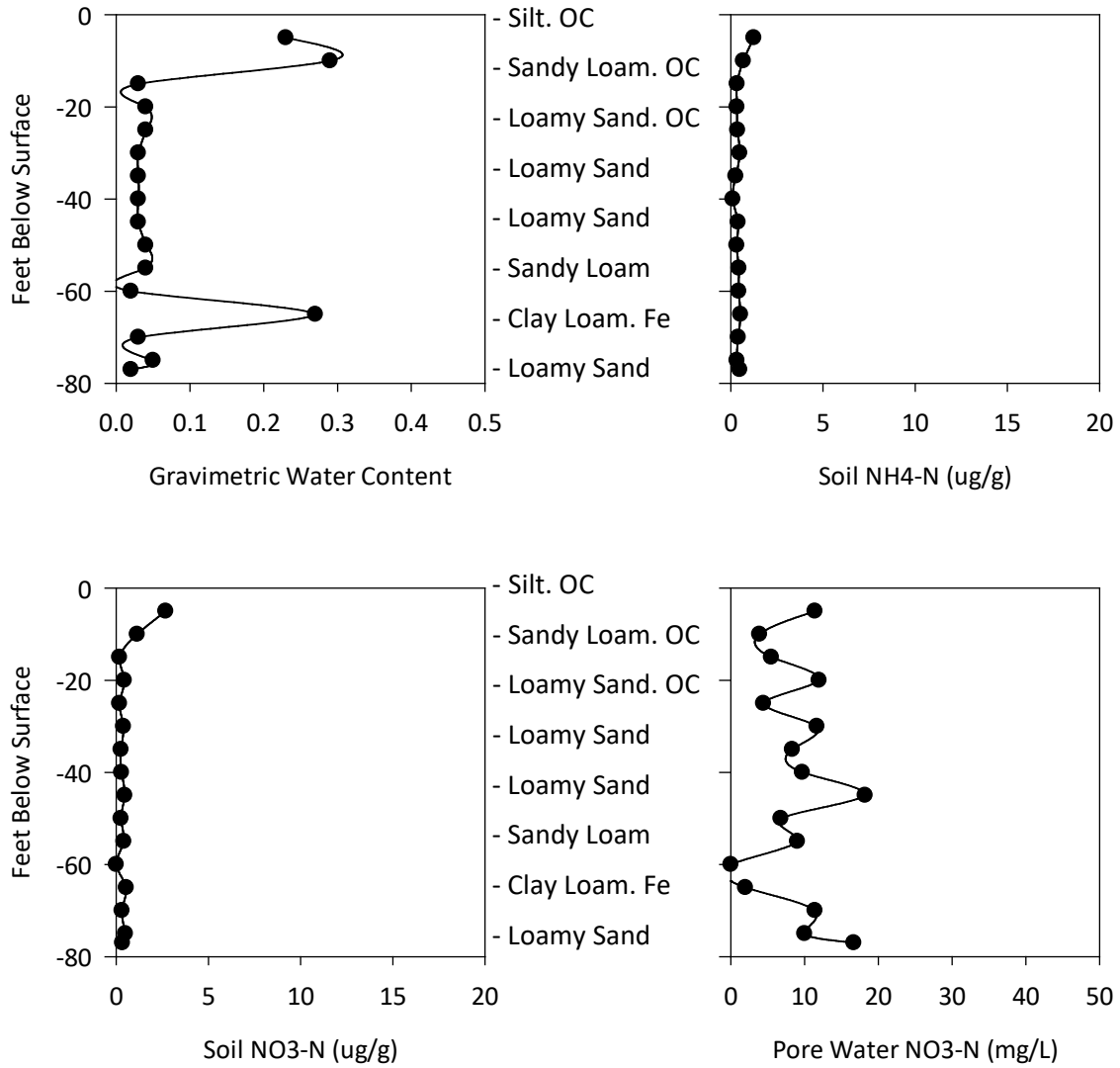


Figure A1. DS-31-2019 Graphs.

Notes: DS-31-2019 : small pivot on 40 acres, irrigated from G-065523. Crop has been harvested.

DS-32-2019

Depth to water: 49 feet, indicated below in dash lines

Total N load= 28 lbs-N/Acre

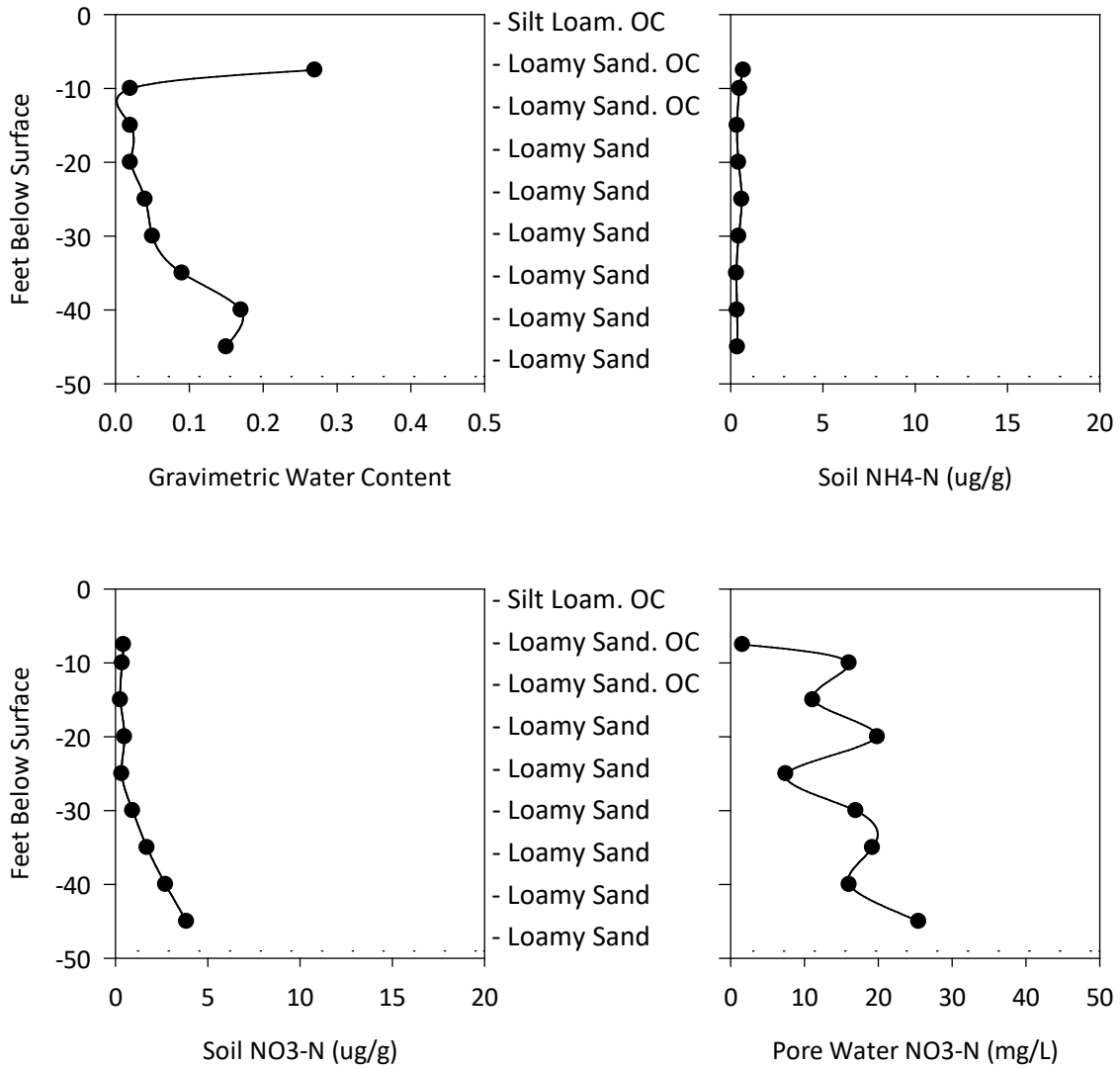


Figure A2. DS-32-2019 Graphs.

Notes: DS-32-2019: irrigated from G-053560 and uses feedlot lagoon water from Kluck’s feedlot in section 9. Corn has been harvested.

DS-33-2019

Depth to water: 13 feet, indicated below in dash lines

Total N load= 59 lbs-N/Acre

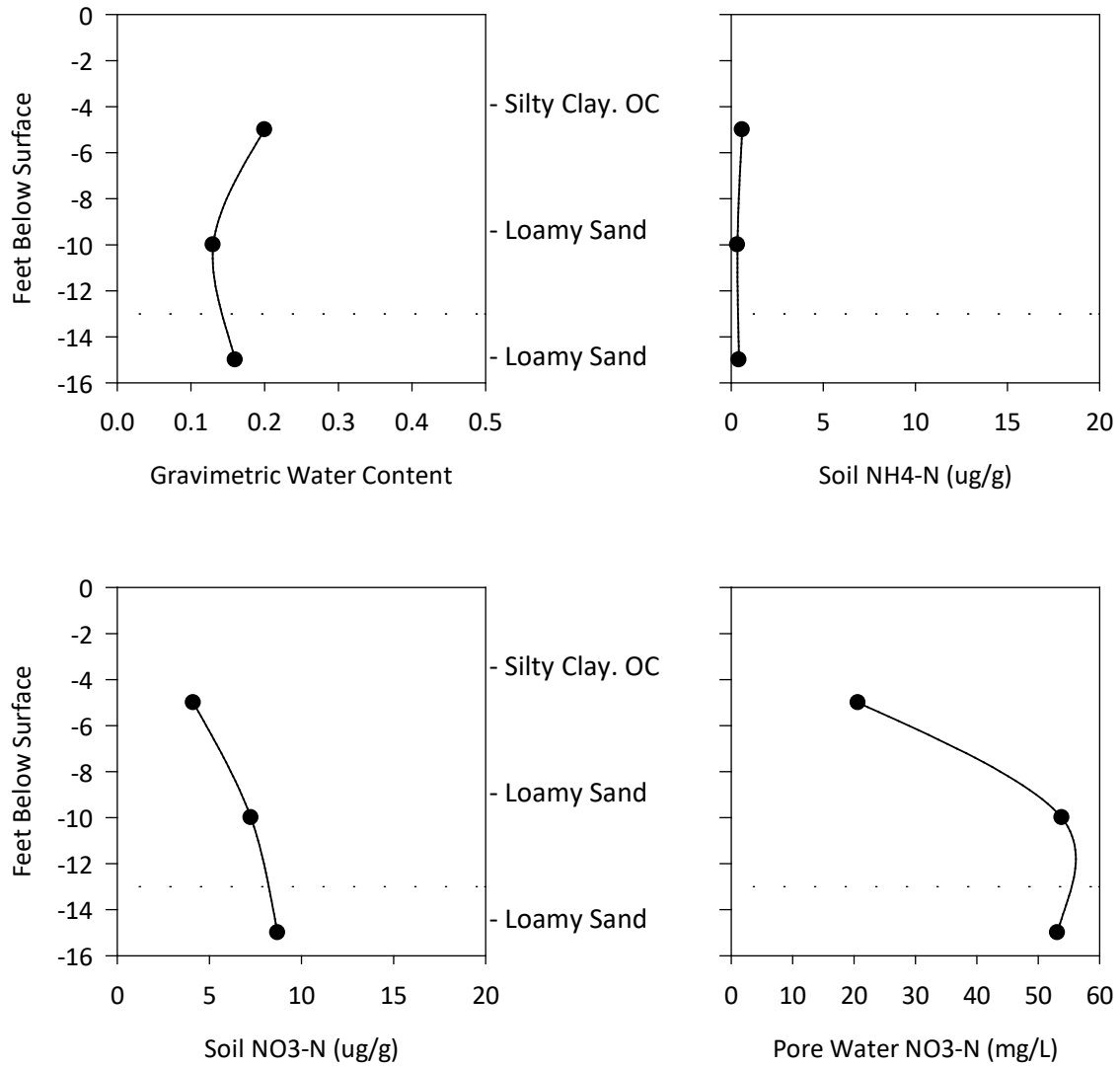


Figure A3. DS-33-2019 Graphs.

Notes: DS-33-2019: near middle of section. Corn has been harvested. On the old map, it seems to show an old paleo valley which goes through the middle of the section from west to east.

DS-35-2019

Depth to water: 63 feet, indicated below in dash lines

Total N load= 93 lbs-N/Acre

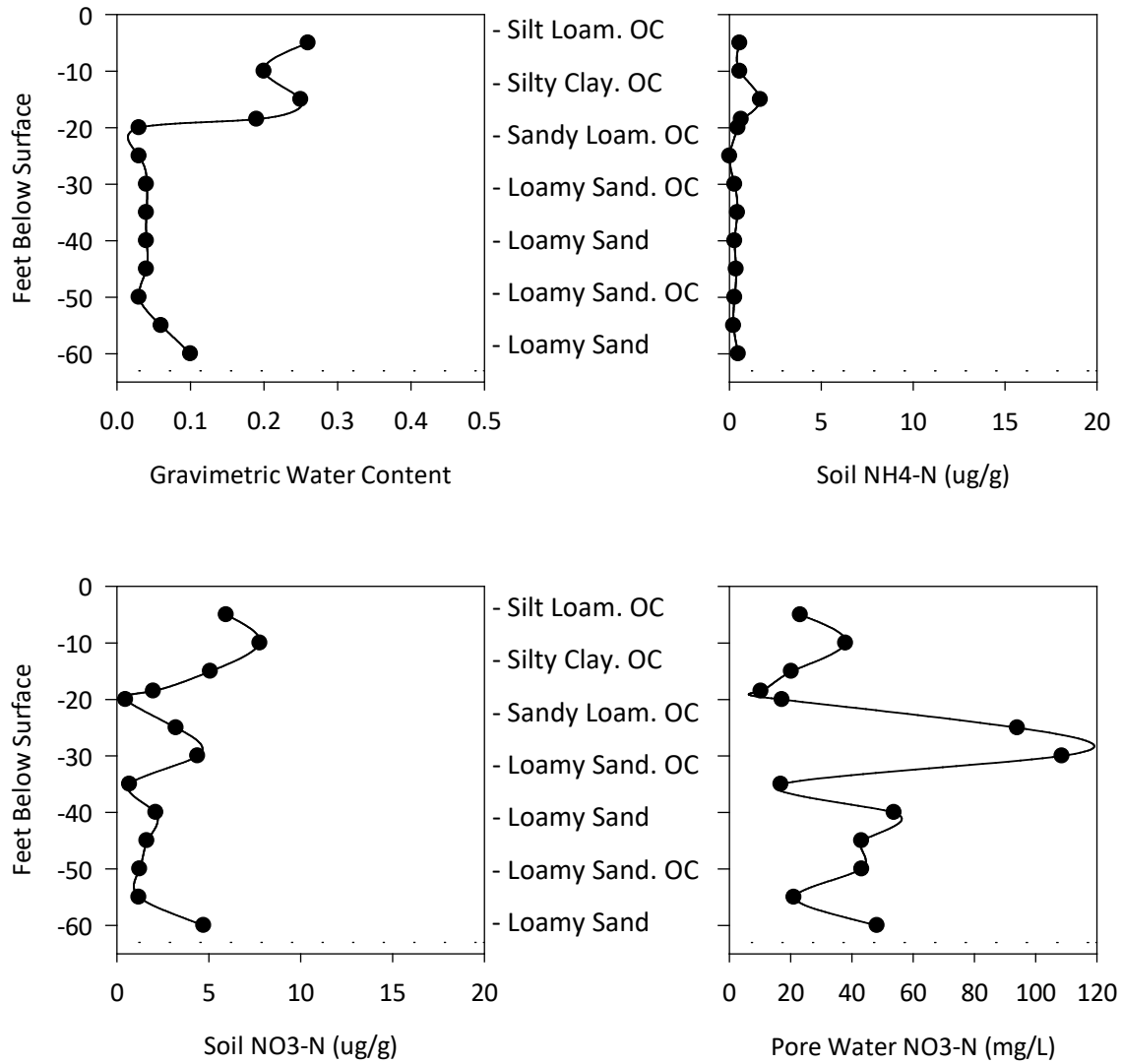


Figure A4. DS-35-2019 Graphs.

Notes: DS-35-2019: sample northwest of the pivot point, east of bins. Crop has been harvested. Irrigation well G-074435. Priority site – near NRD boundaries with feedlot up gradient.

DS-38-2019

Depth to water: 63 feet, indicated below in dash lines

Total N load= 96 lbs-N/Acre

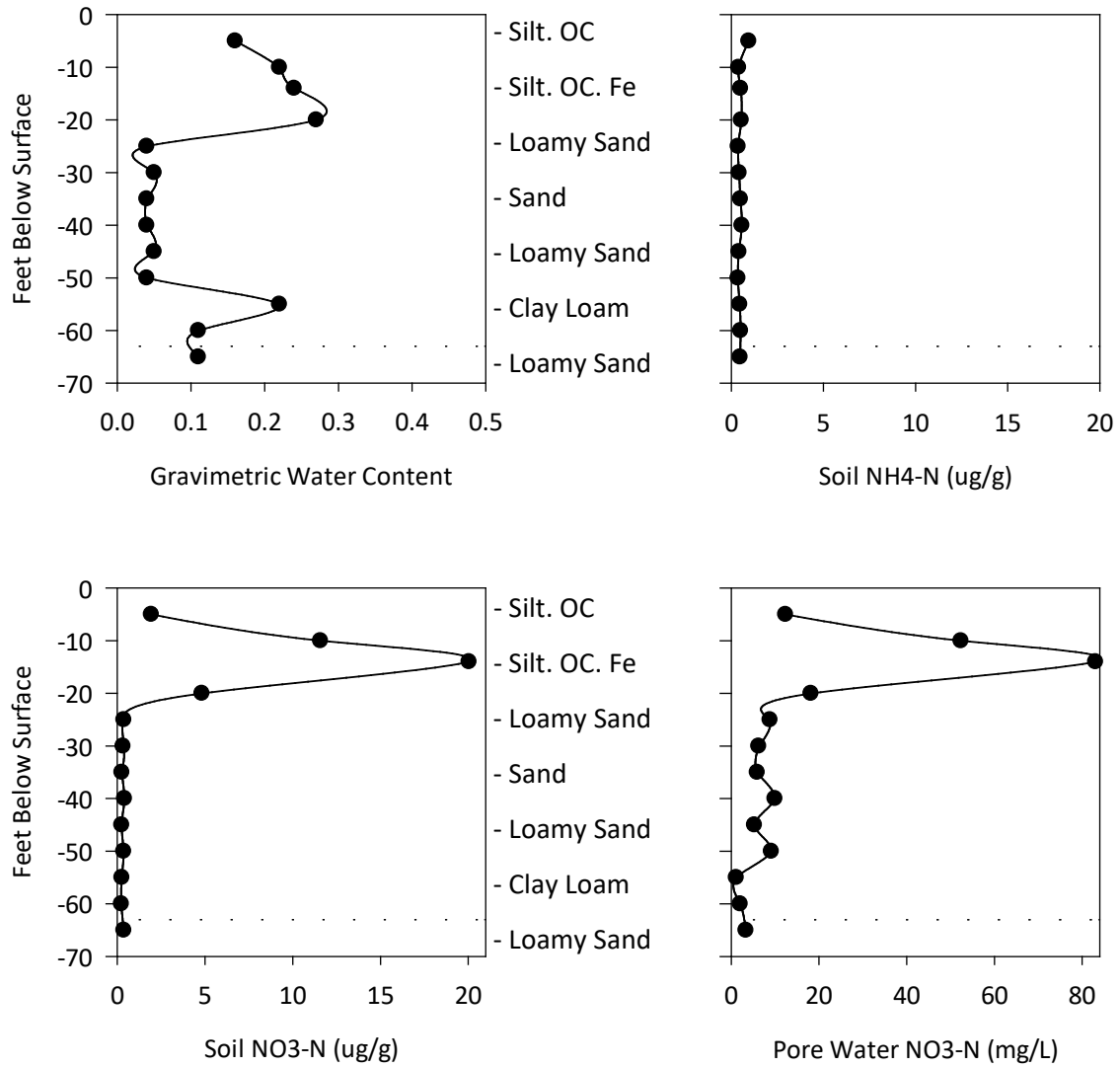


Figure A5. DS-38-2019 Graphs.

Notes: DS-38-2019: irrigation well G-072430 near center of NW¼, also near NRD boundaries.

DS-39-2019

Depth to water: 75 feet
 Total N load= 41 lbs-N/Acre

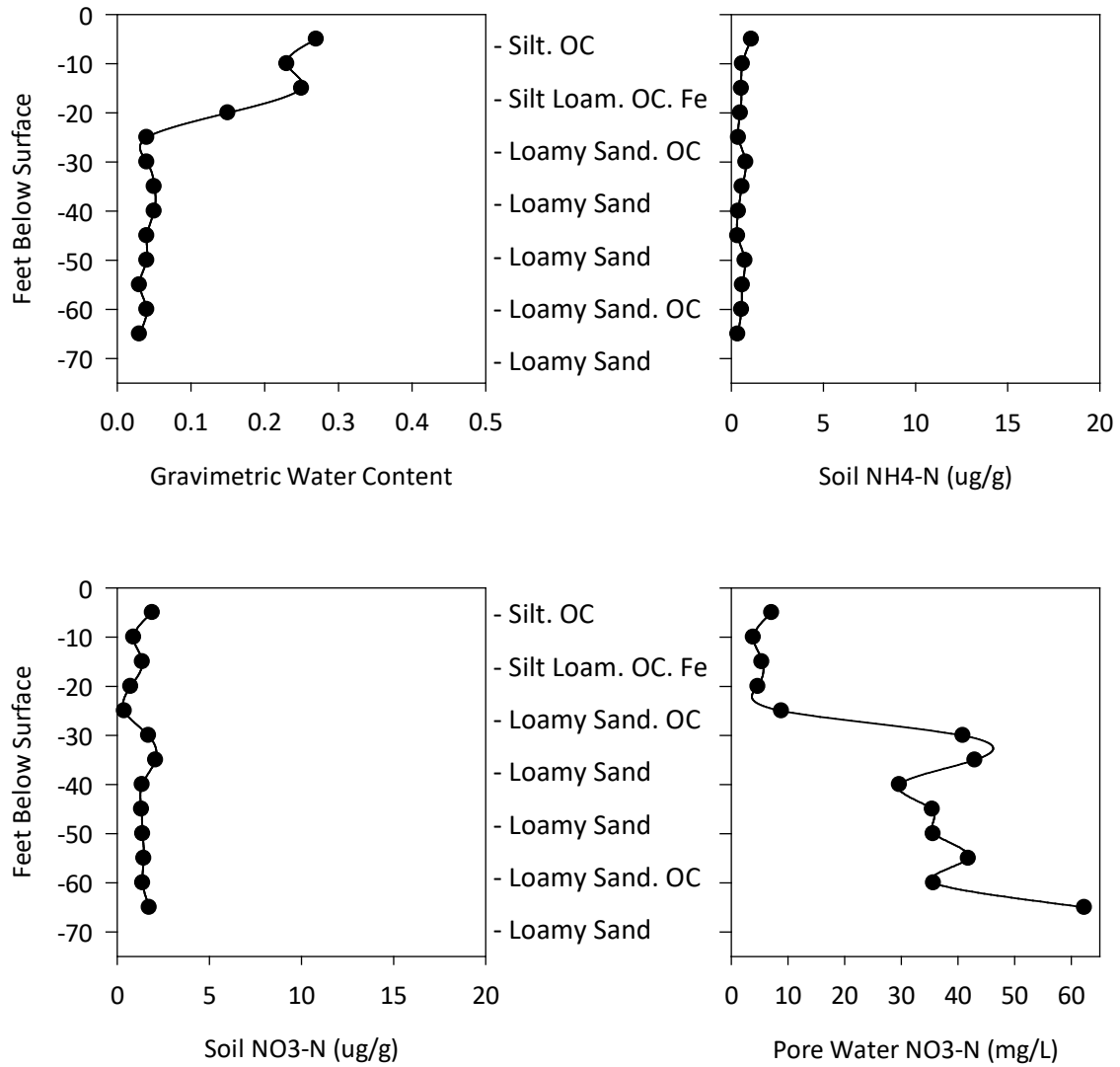


Figure A5. DS-39-2019 Graphs.

Notes: DS-39-2019: corn has been harvested; irrigation well G-039544 near center of NW¼, also near NRD boundaries.

Appendix 2: Tables of Results by Core

DS-31-2019

Core Depth	Bulk Density	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)	Cal. Nitrate (NO3-N)	Lithologic Description
-5	0.71	0.23	7.72	1.25	2.68	11.42	5.16	Dark Brown. Silt. OC
-10	0.88	0.29	8.43	0.68	1.13	3.91	2.69	Light Brown. Silty Clay. OC
-15	1.02	0.03	8.88	0.34	0.18	5.50	0.49	Tan. Sandy Loam. OC
-20	0.89	0.04	8.77	0.33	0.43	11.96	1.05	Tan. Loamy Sand. OC
-25	0.92	0.04	8.8	0.37	0.17	4.44	0.42	Tan. Loamy Sand. OC
-30	0.92	0.03	8.6	0.48	0.39	11.68	0.98	Tan. Loamy Sand. OC
-35	0.85	0.03	7.51	0.27	0.25	8.34	0.58	Tan. Loamy Sand
-40	0.89	0.03	7.94	0.11	0.28	9.70	0.68	Tan. Loamy Sand
-45	0.91	0.03	8.06	0.39	0.46	18.20	1.13	Tan. Loamy Sand
-50	0.90	0.04	8.23	0.32	0.25	6.78	0.62	Tan. Loamy Sand
-55	1.11	0.04	8.33	0.44	0.40	9.04	1.21	Tan. Sandy Loam
-60	0.77	0.02	8.24	0.43	0.00	0.00	0.00	Tan. Sandy Loam
-65	0.90	0.27	7.93	0.53	0.54	1.98	1.31	Light Brown. Clay Loam. Fe
-70	0.94	0.03	8.55	0.40	0.31	11.41	0.78	Tan. Loamy Sand
-75	0.82	0.05	8.46	0.34	0.49	10.01	1.10	Tan. Loamy Sand
-77	0.86	0.02	8.31	0.48	0.33	16.68	0.77	Tan. Loamy Sand. OC

DS-32-2019

Core Depth	Bulk Density	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)	Cal. Nitrate (NO3-N)	Lithologic Description
-7.5	0.62	0.27	8.07	0.69	0.44	1.61	0.73	Light Brown. Silt Loam. OC
-10	0.87	0.02	8.74	0.49	0.36	16.06	0.86	Tan. Loamy Sand. OC
-15	0.79	0.02	8.52	0.35	0.26	11.13	0.56	Tan. Loamy Sand. OC
-20	0.83	0.02	8.2	0.43	0.49	19.88	1.09	Tan. Loamy Sand
-25	0.79	0.04	8.19	0.60	0.33	7.48	0.72	Tan. Loamy Sand
-30	0.82	0.05	8.57	0.44	0.92	16.97	2.06	Tan. Loamy Sand
-35	0.92	0.09	8.66	0.32	1.70	19.21	4.26	Tan. Loamy Sand
-40	0.85	0.17	8.29	0.35	2.71	16.05	6.27	Tan. Loamy Sand
-45	1.11	0.15	8.79	0.37	3.84	25.47	11.60	Tan. Loamy Sand

DS-33-2019

Core Depth	Bulk Density	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)	Cal. Nitrate (NO3-N)	Lithologic Description
-5	1.03	0.20	6.81	0.60	4.12	20.65	11.56	Dark Brown. Silty Clay. OC
-10	1.11	0.13	6.93	0.35	7.25	53.86	21.96	Tan. Loamy Sand
-15	1.09	0.16	7.01	0.43	8.70	53.14	25.76	Tan. Loamy Sand

DS-35-2019

Core Depth	Bulk Density	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)	Cal. Nitrate (NO3-N)	Lithologic Description
-5	0.83	0.26	6.46	0.56	5.94	23.18	13.38	Dark Brown. Silt Loam. OC
-10	0.63	0.20	7.86	0.56	7.77	37.96	13.30	Light Brown. Silt Loam. OC. Fe
-15	0.83	0.25	8.03	1.68	5.08	20.22	11.53	Light Brown. Silty Clay. OC
-18.5	1.05	0.19	8.19	0.64	1.98	10.33	5.66	Light Brown. Silty Clay. OC
-20	1.05	0.03	8.77	0.46	0.46	17.18	1.33	Tan. Sandy Loam. OC
-25	0.89	0.03	8.79	0.02	3.21	94.07	7.74	Tan. Loamy Sand. OC
-30	0.94	0.04	8.84	0.29	4.39	108.63	11.24	Tan. Loamy Sand. OC
-35	0.92	0.04	9.09	0.44	0.68	16.84	1.70	Tan. Loamy Sand. OC
-40	0.88	0.04	9.14	0.29	2.11	53.81	5.06	Tan. Loamy Sand
-45	0.82	0.04	9.22	0.37	1.62	43.17	3.61	Tan. Loamy Sand. OC
-50	0.91	0.03	9.12	0.29	1.23	43.21	3.03	Tan. Loamy Sand. OC
-55	0.86	0.06	9.22	0.23	1.19	21.08	2.80	Tan. Loamy Sand
-60	1.00	0.10	9.13	0.49	4.72	48.26	12.78	Tan. Loamy Sand

DS-38-2019

Bulk Density	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)	Cal. Nitrate (NO3-N)	Lithologic Description
0.75	0.16	7.6	0.95	1.94	12.38	3.98	Light Brown. Silt. OC
0.76	0.22	8.11	0.40	11.58	52.36	23.88	Light Brown. Silt
0.89	0.24	7.79	0.51	20.04	83.05	48.30	Light Brown. Silt. OC. Fe
0.95	0.27	7.97	0.54	4.82	18.16	12.46	Light Brown. Clay. OC. Fe
0.90	0.04	8.64	0.37	0.37	8.84	0.91	Tan. Loamy Sand
0.80	0.05	8.74	0.42	0.33	6.24	0.71	Tan. Sand
0.84	0.04	8.94	0.50	0.26	5.92	0.59	Tan. Sand
1.05	0.04	9.02	0.57	0.41	9.96	1.16	Tan. Loamy Sand
0.97	0.05	8.76	0.42	0.25	5.27	0.65	Tan. Loamy Sand
0.85	0.04	8.57	0.36	0.36	9.13	0.83	Tan. Loamy Sand
0.99	0.22	8.71	0.46	0.25	1.13	0.68	Tan. Clay Loam
0.86	0.11	8.98	0.51	0.23	2.05	0.54	Tan. Loamy Sand
1.01	0.11	8.93	0.48	0.37	3.33	1.02	Tan. Loamy Sand

DS-39-2019

Core Depth	Bulk Density	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)	Cal. Nitrate (NO3-N)	Lithologic Description
-5	0.69	0.27	7.15	1.09	1.90	7.11	3.54	Dark Brown. Silt. OC
-10	0.69	0.23	8.01	0.60	0.88	3.89	1.65	Light Brown. Silt. OC. Fe
-15	0.84	0.25	7.99	0.54	1.36	5.38	3.10	Light Brown. Silt Loam. OC. Fe
-20	1.15	0.15	8.48	0.49	0.73	4.70	2.27	Light Brown. Silt. OC
-25	0.91	0.04	8.86	0.39	0.38	8.86	0.93	Tan. Loamy Sand. OC
-30	0.95	0.04	8.29	0.79	1.69	40.87	4.38	Tan. Loamy Sand
-35	0.83	0.05	8.39	0.58	2.08	42.97	4.69	Tan. Loamy Sand
-40	0.77	0.05	8.43	0.39	1.35	29.64	2.84	Tan. Loamy Sand
-45	0.87	0.04	8.73	0.34	1.31	35.45	3.11	Tan. Loamy Sand
-50	0.84	0.04	8.89	0.74	1.37	35.60	3.14	Tan. Loamy Sand
-55	0.82	0.03	8.77	0.60	1.44	41.83	3.23	Tan. Loamy Sand. OC
-60	0.89	0.04	8.73	0.56	1.37	35.65	3.32	Tan. Loamy Sand
-65	0.93	0.03	8.47	0.35	1.73	62.30	4.37	Tan. Loamy Sand

SS-01-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-3	0.10	7.82	1.32	0.54	5.58
-4	0.03	8.14	0.50	0.42	11.87
-6.5	0.14	8.08	0.69	0.12	0.81

SS-02-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-2	0.24	7.88	1.37	1.59	6.54
-6	0.14	7.85	0.52	0.05	0.34

SS-03-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-2	0.17	7.35	1.98	1.56	9.14
-4.5	0.08	7.87	1.31	0.22	2.66
-7	0.07	8.25	0.93	0.39	5.19

SS-04-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-1.5	0.18	7.79	1.88	1.79	9.82
-6.5	0.13	7.95	0.47	0.25	1.85

SS-05-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-1.5	0.08	6.38	1.17	0.26	3.24
-5	0.03	6.96	0.00	0.18	5.07
-9	0.04	7.19	0.64	0.20	4.97

SS-07-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-2	0.17	6.73	0.77	5.46	32.38
-4	0.16	7.6	1.83	2.35	14.33
-4.5	0.09	7.94	0.00	1.35	14.69

SS-08-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-1.5	0.24	8.13	1.06	1.53	6.39
-2.5	0.17	8.26	0.60	0.52	2.97

SS-09-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-1	0.20	7.96	1.94	1.86	9.38

SS-10-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-4	0.16	6.24	2.00	0.39	2.38
-7.5	0.07	7.34	1.25	0.24	3.29

SS-11-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-4	0.17	6.49	2.27	34.00	200.82
-5.5	0.20	6.46	2.11	115.00	567.36
-10	0.05	7.1	0.00	36.30	728.87

SS-13-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-1	0.17	7.85	1.64	7.42	44.63
-2.5	0.12	8.35	1.01	1.71	13.95
-7.5	0.08	8.63	0.26	1.98	24.76

SS-14-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-0.5	0.11	7.26	0.71	1.78	15.78
-1.5	0.20	8.02	1.65	3.71	18.85
-4.5	0.16	8.24	0.29	5.55	35.36

SS-16-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-3.5	0.17	8.31	1.42	7.03	41.51
-6	0.05	8.62	0.83	3.06	62.20

SS-18A-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-3.5	0.18	7.9	2.37	8.71	47.57

SS-18B-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-3	0.28	7.87	2.20	4.40	15.87

SS-19-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-4	0.42	7.63	2.46	3.31	7.80

SS-26-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-3.5	0.19	7.25	0.66	3.84	20.35

SS-28-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-4	0.13	7.92	1.89	2.74	20.53

SS-B01-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-1	0.14	7.83	2.15	8.00	56.47
-2.5	0.13	7.92	1.13	27.90	221.48
-7.5	0.03	8.32	0.88	2.83	97.53

SS-B05-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-1	0.16	8.17	2.70	1.92	11.95

SS-B07-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-1	0.25	8.36	9.69	7.97	32.52
-4	0.24	8.48	1.32	0.72	3.06

SS-B11-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-1.5	0.13	6.33	2.21	1.04	8.19
-4.5	0.03	7.7	0.82	0.49	17.84
-8	0.02	7.96	0.87	0.71	28.99

SS-B16-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-2	0.22	7.09	0.79	10.90	50.35
-6	0.03	8.07	0.00	2.93	84.40
-9.5	0.06	8.16	0.59	2.58	41.86

SS-B22-2019

Core Depth	Grav. Water Content	pH	Ammonium (NH4-N)	Nitrate (NO3-N)	Cal. Pore Water Nitrate (NO3-N)
-4.5	0.18	7.27	0.63	3.02	16.33
-8	0.13	7.94	0.12	3.01	22.30
-10	0.24	7.88	0.51	3.23	13.29

As and U- results for vadose zone core samples SS-11 and DS-38.

Sample ID	Collection Date	Arsenic ($\mu\text{g/g}$)	Uranium ($\mu\text{g/g}$)
SS-11-0-4	11/19/2019	8.06	1.44
SS-11-4-5.5	11/19/2019	7.75	0.86
SS-11-5.5-10.5	11/19/2019	0.67	0.22
EA115-38-5	3/11/2020	7.96	0.15
EA116-38-10	3/11/2020	8.98	1.37
EA117-38-14	3/11/2020	7.56	1.02
EA118-38-20	3/11/2020	6.60	0.94
EA119-38-25	3/11/2020	0.55	0.17
EA120-38-30	3/11/2020	0.61	0.25
EA121-38-35	3/11/2020	0.66	0.32
EA122-38-40	3/11/2020	0.46	0.22
EA123-38-45	3/11/2020	0.65	0.26
EA124-38-50	3/11/2020	0.62	0.26
EA125-38-55	3/11/2020	0.78	0.40
EA126-38-60	3/11/2020	0.74	0.34
EA127-38-65	3/11/2020	0.73	0.26

Appendix 3: Results of Quality Control

QC Summaries							
Fortified Blanks							
Lab_ID_String	Sample_ID	Collection Date	NO3N (%)	NH4N	Batch	Analysis Date	Project
19-9159	LFB	11/19/2019	103.20	87.60	W19986	2/17/2020	QA/QC
20-471	QA/QC LFB	1/8/2020	103.40	105.4	W20050	3/30/2020	QA/QC
20-504	QA/QC LFB	1/12/2020	104.40	111.8	W20051	3/30/2020	QA/QC
20-845	QA/QC LFB	1/20/2020	100.40	112.8	W20097	3/30/2020	QA/QC
20-974	QA/QC LFB	2/12/2020	102.40	92.00	W20105	3/30/2020	QA/QC
20-6094	LFB	8/30/2020	102.00	92.00	W20599	10/26/2020	QA/QC
20-6115	LFB	9/14/2020	102.00	92.00	W20600	10/27/2020	QA/QC
20-6157	LFB	8/30/2020	102.00	92.00	W20602	10/27/2020	QA/QC
20-6164	LFB	8/30/2020	102.00	92.00	W20603	10/26/2020	QA/QC
20-6468	LFB	11/16/2020	113.60	113.60	W20646	11/20/2020	QA/QC
20-6505	LFB	11/16/2020	113.60	113.60	W20648	11/20/2020	QA/QC
		Averages (%)	104.6	101.7			
		Standard Dev (%)	4.9	10.5			
Method Blanks							
19-9160	LRB	11/19/2019	0.09	0.00	W19986	2/17/2020	QA/QC
20-936	QA/QC LRB	2/10/2020	0.00	0.00	W20104	3/30/2020	QA/QC
20-975	QA/QC LRB	2/12/2020	0.00	0.00	W20105	3/30/2020	QA/QC
20-1817	EA89-LRB	3/11/2020	0.03	0.05	W20150	3/13/2020	QA/QC
20-1839	EA111-LRB	3/11/2020	0.06	0.42	W20151	3/13/2020	QA/QC
20-1862	EA134-LRB	3/11/2020	0.11	0.29	W20152	3/13/2020	QA/QC
20-6095	LRB	8/30/2020	0.00	0.10	W20599	10/26/2020	QA/QC
20-6158	LRB	8/30/2020	0.00	0.00	W20602	10/27/2020	QA/QC
20-6165	LRB	8/30/2020	0.00	0.00	W20603	10/26/2020	QA/QC
20-6469	LRB	11/16/2020	0.00	0.00	W20646	11/20/2020	QA/QC
20-6488	LRB	11/16/2020	0.00	0.00	W20647	11/20/2020	QA/QC
20-6506	LRB	11/16/2020	0.00	0.00	W20648	11/20/2020	QA/QC
Laboratory Duplicates							
Lab_ID_String	Sample_ID	Collection_Date	NO3N	NH4N	Batch	Analysis Date	
19-9100	SS-7-0-2	11/25/2019	5.45	0.48	W19984	2/17/2020	19_AndD_LPNNRD_L
19-9101	SS-7-0-2 LD2	11/25/2019	5.46	0.77	W19984	2/17/2020	QA/QC
		Range	0.01	0.29			
19-9118	SS-14-1.5-4.5	11/25/2019	5.56	0.34	W19985	2/17/2020	19_AndD_LPNNRD_L
19-9119	SS-14-1.5-4.5 LD2	11/25/2019	5.55	0.29	W19985	2/17/2020	QA/QC
		Range	0.01	0.05			

20-1836	EA108-32-45	3/11/2020	3.84	0.37	W20151	3/13/2020	19_AndD_LPNNRD_L
20-1837	EA109R	3/11/2020	3.63	0.47	W20151	3/13/2020	QA/QC
		Range	0.21	0.10			
20-6470	SS-BAILEY 6-4.5-5	11/16/2020	1.21	1.03	W20647	11/20/2020	19_AndD_LPNNRD_VADOSE_L
20-6471	SS-BAILEY 6-4.5-5 LD2	11/16/2020	0.90	2.02	W20647	11/20/2020	QA/QC
		Range	0.31	1.00			
20-6489	SS-BOHAC 4-0-2	11/16/2020	1.14	2.76	W20648	11/20/2020	19_AndD_LPNNRD_VADOSE_L
20-6490	SS-BOHAC 4-0-2 LD2	11/16/2020	1.11	2.80	W20648	11/20/2020	QA/QC
		Range	0.03	0.04			
20-6451	SS-BAILEY 1-0-3	11/16/2020	5.57	0.97	W20646	11/20/2020	19_AndD_LPNNRD_VADOSE_L
20-6452	SS-BAILEY 1-0-3 LD2	11/16/2020	5.70	1.57	W20646	11/20/2020	QA/QC
		Range	0.13	0.60			

List of the Standard Operating Procedures (SOPs) used in this project

Parameter	Units	Typical Sample size	Detection Limit	Expected range	Method Reference
Textural description	NA	Core section	NA	NA	Attachment 2.1: Soil Core Processing WSL SOP07_06_02.002
Gravimetric water content	gm/gm solid	100 grams	0.005	0-0.35	Attachment 2.1: Soil Core Processing
Bulk Density	gm/cm ³	50-70 cm ³	NA	1-3.0	Attachment 2.1: Soil Core Processing
Soil pH	pH	5 grams	NA	5-8	Attachment 2.1: Soil Core Processing
Soil NO ₃ N and NH ₄ N	µg/g	10 grams	0.005	0.0-100	Attachment 2.3: Lachat QuikChem 8500 WSL SOP13_02_02_001
Acid leachable metals	ng/g	10 grams	0.05 to 0.1	0.0-500	Attachment 2.3: Lachat QuikChem 8500
Particle size (sand/silt/clay)	(%)	15 grams	NA	0-100	Attachment 2.8 Soil Particle Size Analysis

Analytical Method	SOP by Numbers	Dates Active
Plan, obtain, label, document, and store cores for further analyses	1: Field Soil Coring	
Prepare a soil core subsample for instrumental analysis	2: Soil Core Processing	7/10/2018 – present
Core Extrusion	2: Soil Core Processing	7/10/2018 – present
NO ₃ /NH ₄ & PH Processing	2: Soil Core Processing	7/10/2018 – present
PH	2: Soil Core Processing	7/10/2018 – present
Flow injection analysis	3: Lachat QuikChem 8500	
Particle size analysis	4: Particle Fractionation and Particle-Size Analysis	3/15/2018 – present
Inductively coupled plasma-mass spectrometry (ICP-MS)	5: Microwave Assisted Acid	3/2/2018 – present

for analysis of element concentration	Digestion for Elemental Analysis by ICP-MS	
Inductively coupled plasma-mass spectrometry (ICP-MS) for elemental analysis	6: Analysis of Dissolved Trace Elements in Aqueous Solutions by ICP-MS	3/14/2018 – present
Microwave-assisted solvent extraction (MASE) and gas chromatography mass spectrometry (GC/MS) for analysis of herbicides in solid samples (i.e. soils, manure, etc)	7: Analysis of herbicides in solid samples by MASE and GC/MS	02/2017 – present
Soil texture analysis	8: Soil Particle Size Analysis	

To access the Standard Operating Procedures, please go to the Nebraska Vadose Zone website, and see Monitoring Guidance (<http://nebraskavadose.unl.edu/monitoringguidance.asp>).

Draft Changes				
Application Number	Applicant Name	Date:	12/22/21 3:10 PM	
LPN-V-022-9999			Total Score->	0
Category	Divisions	Points Available	Percent of Application	Points Received

Expansion of acres on existing well	WF= 1.0			
	Expand 1 to 20 acres	100	0	0
	Expand 21 to 40 acres	80	0	0
	Expand 41 to 80 acres	60	0	0
One continuous tract	Expand 81 to 120 acres	40	0	0
One continuous tract	Expand 121 to 160 acres	20	0	0
Non-contiuous tract	Expand 41 to 160 acres	0	0	0
			Total ->	0

Expansion of acres on new well	WF= 0.75			
	Expand 1 to 34 acres	20	0	0
One continuous tract (wiper pivot)	Expand 35 to 160 acres	40	0	0
One continuous tract (full circle)	Expand 35 to 110 acres	80	0	0
One continuous tract (full circle)	Expand 111 to 160 acres	100	0	0
Non-contiuous tract	Expand 41 to 160 acres	0	0	0
			Total ->	0

Irrigation System	WF= 1.0	New Numbers		
	Subsurface Drip	100	0	0
	Surface Drip	80	0	0
	Pivot	60	0	0
	Gravity, Gun, Other	10	0	0
			0	0
			Total ->	0

Land Class of field	WF= 1.0			
	Class 1	100	0	0
	Class 2	80	0	0
	Class 3	60	0	0
	Class 4	40	0	0
	Class 5	10	0	0
	Class 6-8/ not more than 20%	0	0	0
			Total ->	0

Stream Depletion Factor From DNR	WF= 1.25			
	10 to 20%	100	0	0
	21 to 30%	90	0	0
	31 to 40%	80	0	0
	41 to 50%	70	0	0
	51 to 60%	60	0	0
	61 to 70%	50	0	0
	71 to 80%	40	0	0
	81 to 90%	20	0	0
	>90%	10	0	0
			Total ->	0

Saturated Thickness	WF= 1.0			
	176 to 200 ft.	100	0	0
	151 to 175 ft.	90	0	0
	126 to 150 ft.	80	0	0
	101 to 125 ft.	70	0	0
	76 to 100 ft.	40	0	0

51 to 75 ft.	20	0	0
26 to 50 ft.	10	0	0
0 to 25 ft.	0	0	0
		Total ->	0

Specific Yield **WF= 1.0**

18.1 to 22 %	100	0	0
14.1 to 18 %	60	0	0
10.1 to 14 %	30	0	0
6.1 to 10 %	10	0	0
2 to 6%	0	0	0
		Total ->	0

Transmissivity **WF= 1.0**

21331 to 23700	100	0	0
18961 to 21330	90	0	0
16591 to 18960	80	0	0
14221 to 16590	70	0	0
11851 to 14220	60	0	0
9481 to 11850	50	0	0
7111 to 9480	40	0	0
4741 to 7110	30	0	0
2371 to 4740	20	0	0
0 to 2370	10	0	0
		Total ->	0

<p>Minimum Score of 300 is needed to be considered for variance approval Once a variance is submitted and not approved, it will be carried over for 3 years Land Classes 6-8, with slopes, greater than 20% of the parcel not eligible for a variance</p>	Total Score->	0
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Date: December 9, 2021

Attn: Daryl Andersen
Lower Platte North Natural Resources District PO
Box 126
Wahoo, NE 68066

From: Katie Cameron, ENWRA Project Coordinator

RE: 2021 Eastern Nebraska Water Resources Assessment (ENWRA) Annual Invoices and Activities Update:

- Coordination: routine administration, financial budget through Lower Platte South NRD, spring technical meeting, website updates/Dropbox management, test hole advancements with CSD, and GeoScene3D Project updates for NRDs. Both the ENWRA 6-NRD interlocal and 10-NRD GeoCloud Interlocal renewal agreements will be coming soon for NRD review and signature (tentatively on the January or February 2022 Lower Platte South NRD board schedule). The FY 23 GeoCloud annual total is expected to be less than \$25,000 (compared to \$54,900 current FY22 total split by 10 NRDs) and the ENWRA dues will remain the same for each NRD with the exception of Lewis and Clark NRD which will go up by \$2,150 per year.
- ENWRA supplied over 27 public inquiry reports on the AEM datasets: interagency inquiries, private landowner inquiries, and several consultant requests coordinated through the NRDs. ENWRA inquiries starting in 2022 will be tracked in the GeoScene3D projects for each NRD on Dropbox.
- ENWRA pilot site maintenance, transducer downloads, and sampling fieldwork for 78 pilot site wells. Several older deep well pumps went bad at all three sites, possibly due to sedimentation or fouling of screens. Compilation, graphing and evaluating of lab and transducer data for the ENWRA website (linked to our Dropbox: https://www.dropbox.com/sh/kug64jl1eqk27gh/AAB3PVFTBsK9_iLZ2_8Z-KZCa?dl=0) Additional follow-up nitrate sampling was conducted at the Firth shallow well for lab comparison to AquaTroll 600 readings of nitrates every 8 hours. The second nitrate sensor also appears, based on our 2020 and 2021 graphed data, to drift too much to be useful. However, the AquaTroll will be available to NRDs for future localized short- or long-term conductivity and other parameter uses. Pilot site sampling results for the Ashland Vadose Upland Site (monitoring well 55 feet deep) and a summary of the Mead area weather station specific to Lower Platte North are also on the ENWRA Dropbox with the pilot site data link above. Additional metals analyses were conducted for the Ashland Pilot site by USGS in 2021 for wells in the P-MRNRD and posted on the ENWRA Dropbox too (arsenic exceeded the MCL on a couple wells and low lead levels were detected in a few sample locations).
- ENWRA submitted a Water Sustainability Fund (WSF) Natural Resources Commission (NRC) Grant application July 27, 2021, We should find out at the December 15th 2021 commission meeting if ENWRA was awarded.

Kathleen Cameron, Survey Hydrogeologist/ENWRA Coordinator
kcameron_enwra@lpsnrd.org

Enclosures

ENWRA
PO Box 83581
Lincoln, NE 68501-3581

INVOICE

INVOICE #3068
DATE: December 9, 2021

TO: Lower Platte North Natural Resources District
PO Box 126
Wahoo, NE 68066
Attn: Daryl Andersen

DESCRIPTION	AMOUNT
FY 2022 ENWRA annual dues	\$30,000
TOTAL	\$30,000

Make all checks payable to ENWRA.

Thank you!

ENWRA
PO Box 83581
Lincoln, NE 68501-3581

INVOICE

INVOICE #4042
DATE: December 9, 2021

TO: Lower Platte North Natural Resources District
PO Box 126
Wahoo, NE 68066
Attn: Daryl Andersen

DESCRIPTION	AMOUNT
FY 2022 annual Nebraska GeoCloud (NGC) dues (second of two equivalent payment obligations under the 10 NRD interlocal NGC agreement renewal dated May 14, 2020)	\$3,400
TOTAL	\$3,400

Make all checks payable to ENWRA.

Thank you!

ARTICLE IV

FUNDING

Section 4.01

Each District will budget funds for fiscal year FY2021 and FY2022 as follows:

Financial Sponsors	FY21	FY22	Total
LPSNRD	\$3,400	\$3,400	\$6,800
LPNNRD	\$3,400	\$3,400	\$6,800
P-MRNRD	\$3,400	\$3,400	\$6,800
LCNRD	\$1,000	\$1,000	\$2,000
LENRD	\$3,400	\$3,400	\$6,800
NNRD	\$3,400	\$3,400	\$6,800
LLNRD	\$3,400	\$3,400	\$6,800
UENRD	\$1,700	\$1,700	\$3,400
CPNRD	\$3,400	\$3,400	\$6,800
TPNRD	\$3,400	\$3,400	\$6,800
ENWRA (LCNRD, LENRD, LPNNRD, LPSNRD, NNRD, P-MRNRD)	\$25,000	\$25,000	\$50,000
TOTALS	\$54,900	\$54,900	\$109,800

ARTICLE V

POWERS

Section 5.01

The DISTRICTS shall have all of the powers and authorities pursuant to state statutes that are necessary to carryout the stated objective and purpose on behalf of the NGC ICA joint and cooperative effort.

Section 5.02

Memorandum

Date: January , 2022

To: Each Director

From: Katie Cameron, ENWRA Project Coordinator

Subject: Authorization for the General Manager to sign **seven** ENWRA- related agreements:

Item #1) Water Sustainability Fund (WSF #5312) Award Agreement with two sub agreements:

- a) Nebraska Department of Natural Resources (NeDNR) contract #5312
- b) University of Nebraska Lincoln, School of Natural Resources Conservation and Survey Division project team (UNL CSD) Cooperative Agreement
- c) U.S. Geological Survey (USGS) Joint Funding Agreement (JFA)

Item #2) Nebraska GeoCloud (NGC) 5 Year Agreement

- a) NRD Interlocal subagreement:
- b) UNL CSD Cooperative Agreement

Item #3) ENWRA 5 Year Interlocal renewal w/ 6 member NRDs

Item #4) The ENWRA Coordinator Position with the University of Nebraska Conservation and Survey Division (UNL CSD)

Item #1: Authorization for the General Manager to sign the Water Sustainability Fund (WSF) Grant Contract #5312 (**item 1a attached**) between the NeDNR and the District (on behalf of ENWRA) to accept \$144,000 in grant funds contingent on the execution and legal review of two associated subagreements provide for the study scope indicated in the grant contract (**Items 1b and 1c, attached**).

ENWRA's WSF application #5312 (item 1a. includes Section A of the grant application further describing grant tasks and schedules attached to this memo): ENWRA Groundwater Recharge Mapping and Focus Area Assessments (Project)., a \$240,000 project, was approved for funding by the Natural Resources Commission (NRC) on December 15, 2021. WSF reimburses 60% of eligible project costs (\$144,000) with ENWRA paying \$96,000 out-of-pocket and USGS providing \$74,000 cooperative dollars outlined in the JFA (Item 1c). The reinterpretation of historical water-quality data, use of Airborne Electromagnetic (AEM) survey data and updated water level contour products generated with the Project will allow an assessment of the effectiveness of using AEM to assess groundwater vulnerability in eastern Nebraska. One of the Project focus areas specific to the LPNSRD, the Dorchester-Sterling paleovalley area, will also provide the District more hydrogeologic information regarding the sustainability of the Crete-Princeton-Adams groundwater reservoir. This Project proposes collaboration between the ENWRA districts and technical partners across district boundaries for understanding recharge in the eastern Nebraska glaciated region.

Item #2: The current Nebraska GeoCloud (NGC) 10 NRD interlocal agreement ends on June 30, 2022. The 6 ENWRA NRDs wish to continue support of the NGC (**Item #2 attached, includes UNL CSD sub agreement**) through ENWRA's annual budget as outlined in the attached agreement (Table in Section 4.01). Depending on the final support commitment amounts of the additional NRDs beyond ENWRA with AEM data, ENWRA would pay between \$15,000 to \$25,000 per year of their annual \$25,000 data management budget category previously going toward the NGC since 2017. With the approval of this agenda item, all of the necessary agreements to operate and maintain the NGC (includes server storage, web interface hosting and maintenance for Nebraska viewer licenses) for the next five years will be in place (Fiscal Year [FY] 2023 to FY 2027, July 1, 2023 to June 30, 2027).

Item #3: The current ENWRA Interlocal Agreement term ends June 30, 2022. Amendment #7 to the ENWRA Interlocal (**Item #3 Attachment**) will renew the coalition agreement to cover the next five years (Fiscal Year [FY] 2023 to FY 2027, July 1, 2023 to June 30, 2027). The ENWRA interlocal renewal commits the 6 NRDs to the annual dues amounts listed on page 2 of the Amendment #7. No dollars change from the previous 5 years except for the Lewis and Clark NRD which is increased from \$7,000 annually up to \$9,150 to match the \$9,150 assessment reimbursements distributed every few years back to the NRDs as outlined in ENWRA's Long Range Plan. The annual dues will remain the same for the remaining Districts (Lower Platte South's annual dues are \$30,000).

Item #4: The ENWRA Coordinator position with UNL CSD is also up for renewal at the end of June 30, 2022. Amendment 2 to the UNL-CSD Agreement included as (**Item #4 Attachment**) extends the term for the ENWRA Coordinator position out 5 years (through June 30, 2027) to match Amendment #7 to the ENWRA Interlocal (the interlocal and CSD agreements are Exhibit As to each other's documents).

Item #1a: Recommend the Board of Directors authorize the District General Manager to sign the Nebraska Department of Natural Resources Water Sustainability Fund Grant Contract #5312 on behalf of the Eastern Nebraska Water Resources Assessment to receive the \$144,000.00 in state granted funds (60%) with \$96,000.00 local match funds (40%)

Item #1b: Recommend the Board of Directors authorize the District General Manager to sign the University of Nebraska Conservation and Survey cooperative agreement (\$89,000) for accomplishing the WSF Contract #5312 grant scope

Item #1c: Recommend the Board of Directors authorize the District General Manager to sign the U.S. Geological Survey Joint Funding Agreement for accomplishing the WSF Contract #5312 grant scope (\$151,000 in ENWRA funds, \$74,000 in USGS cooperative dollars)

Item #2: Recommend the Board of Directors authorize the District General Manager to sign the NGC XX NRD Interlocal (\$115,000 in ENWRA funds plus XX NRD funds) and associated University of Nebraska Conservation and Survey Division (UNL CSD) subagreement (pending the execution of the interlocal) to provide the UNL CSD \$115,000 for the Nebraska GeoCloud, pending completion of legal reviews

Item #3: Recommend the Board of Directors authorize the District General Manager to sign the Eastern Nebraska Water Resources Assessment (ENWRA) Interlocal Agreement Amendment #7 extending the ENWRA interlocal agreement 5 more Fiscal Years pending completion of legal reviews

Item #4: Recommend the Board of Directors authorize the District General Manager to sign the Cooperative Agreement providing the University of Nebraska Conservation and Survey Division (UNL CSD) 60 percent (%) of the salary and benefits plus operating costs for the ENWRA Coordinator Position for the next 5 Fiscal Years pending completion of legal reviews

DRAFT

**STATE OF NEBRASKA
DEPARTMENT OF NATURAL RESOURCES
NEBRASKA WATER SUSTAINABILITY FUND
GRANT AWARD AGREEMENT
FOR APPLICATION NO. 5312**

This Agreement is entered into by and between the Nebraska Department of Natural Resources (Department) and the applicant organization, Lower Platte South Natural Resources District (Sponsor), sometimes hereinafter individually referred to as “Party,” or collectively referred to as “Parties.”

WHEREAS, pursuant to the Nebraska Water Sustainability Fund Grant Program (Fund), *Neb. Rev. Stat.* § 61-222 and § 2-1511(2), and Title 261 of the Nebraska Administrative Code (NAC Title 261), the Nebraska Natural Resources Commission (Commission) and the Department are charged with the responsibilities of establishing and administering a grant process for the purpose of attaining the goals set out in *Neb. Rev. Stat.* § 2-1506; and

WHEREAS, the Sponsor submitted application number 5312 (Application) requesting a grant under the Fund for a project titled ENWRA Groundwater Recharge Mapping and Focus Area Assessments (Project). A copy of the Application is located at nrc.nebraska.gov and is hereby incorporated by reference into this Agreement; and

WHEREAS, the Commission has adopted rules for administration of the Fund under NAC Title 261, which are hereby incorporated into this Agreement by reference; and

WHEREAS, the Commission approved the Project and awarded the Sponsor a grant of \$144,000.00 to carry out the Project.

NOW, THEREFORE, in consideration of the mutual promises and understandings contained herein, the receipt and sufficiency of which is hereby acknowledged, the Department and Sponsor hereby mutually agree as follows:

1. Exclusive State Funding.

Resources from the Fund will not replace any local share required by other state funds expended by the Sponsor in carrying out the Project.

2. Term.

This Agreement shall be for a term commencing on December 16, 2021 and continuing thereafter until Project close out, unless all eligible reimbursements are made prior to that time thus terminating the Agreement as completed, or unless the Agreement is:

A. Terminated with cause in the event either Party defaults on any of its material obligations or representations under this Agreement. The non-defaulting party shall notify the other Party in writing, specifying in detail the nature and extent of such

breach. If within thirty (30) calendar days after written notice of such default, the defaulting Party fails to remedy the default, this Agreement will terminate.

B. Terminated by the Department, in whole or in part, in the event funding is no longer available. If funds are revoked by the Legislature, the Department may terminate any portions of the Agreement for which funds have become unavailable. The Department will give the Sponsor notice of such revocation as soon as possible. The Sponsor shall be entitled to receive reimbursements subject to the availability of such funds for any authorized work that has been satisfactorily completed as of the termination date.

C. Amended by written amendment signed by both parties.

3. Scope of Agreement.

A. Sponsor shall complete through its own efforts, or through contracting with a capable party, the obligations for completing the Project as set forth in the Application.

B. Any changes to the scope of the Project shall be considered according to procedures set out in NAC Title 261.

C. Coordination, Communication, and Data Sharing with the Department.

1. Throughout the Project timeline, Sponsor shall coordinate and communicate with the Department on the Project's compatibility with water management goals, objectives, and action items resulting from the joint planning efforts between Sponsor and the Department.

2. Within sixty (60) days following the execution of this Agreement, Sponsor and Department shall meet to further mutually define the scope of this coordination and communication requirement.

3. Sponsor shall share with the Department all data that is generated as a result of this Project in a form that includes documentation and metadata and that is mutually agreed upon by Sponsor and Department.

4. Agreement Managers.

A. The Department's Agreement Manager is Kent Zimmerman. His telephone number is (402) 471-0575. His address is: Nebraska Department of Natural Resources, P.O. Box 94676, Lincoln, NE 68509-4676. His email address is kent.zimmerman@nebraska.gov.

B. The Sponsor shall designate a person as the Sponsor's Agreement Manager to direct or report on the Sponsor's work under the Project and coordinate with the Department. The Sponsor's Agreement Manager is

_____ and his/her address is _____.
His/her email address is _____.

- C. Communications under this Agreement shall be through the respective Agreement Managers.
- D. The Sponsor may change its Agreement Manager only after notifying the Department in writing.

5. Reimbursement.

- A. From the annual appropriations by the Legislature to the Fund and set aside by the Commission, but subject to subsequent quarterly limitations that may be imposed by the Department of Administrative Service's Budget Office, the Department agrees to reimburse the Sponsor for eligible costs as defined in NAC Title 261 that are incurred after approval by the Commission in the application process and during the term of this Agreement in performance of activities necessary for the Project as described in the Application.
- B. Total reimbursement amount and payments for this Project shall not exceed \$144,000.00. Reimbursements shall be limited to amounts approved by the Department as: 1) having met the definition of eligible costs under NAC Title 261; and 2) that include adequate documentation. Reimbursements under the Fund shall not be made for litigation-related costs in acquiring property rights or other permits necessary for the Project.
- C. Reimbursement shall be made for expenses electronically submitted by the Sponsor to the Department's Agreement Manager. All submissions shall include a detailed, itemized summary of each reimbursable expenditure and include all appropriate support documentation.
 - (1) Reimbursement requests for expenditures acquiring interests in real property must include, for each legal interest acquired:
 - (a) Title insurance policy showing title in the seller;
 - (b) Closing statement signed by both the buyer and seller;
 - (c) Copy of recorded instrument (deed/easement) from the seller to the Sponsor for the specified real estate;
 - (d) Copy of certified check or wire transfer payable to the seller for the indicated transaction; and
 - (e) Brief explanation of the relationship of the property interest to the Project.
 - (f) If an irrigation water use is to be leased, relinquished, retired or purchased, then prior to the Sponsor entering into an agreement with the real property owner, the Sponsor shall consult with the Department for the purpose of determining if (a) the surface water right is valid and not subject to some known restriction or limitation (such as CREP) or (b) the ground water use is subject to some known restriction or limitation (such as CREP).

ITEM 1a

- D. Reimbursement payments shall be made by the Department no more often than monthly based upon the reimbursement request submissions. The final billing for all expenses under this Agreement must be clearly marked “final billing.” Upon payment of the final billing, any unused Project funds will be transferred into the unreserved balance of the Water Sustainability Fund pursuant to Neb. Rev. Stat. § 2-1507 (4).
- E. Expense records shall be subject to inspection by the Department and any other agency of the State of Nebraska with responsibility for monitoring progress or auditing records pursuant to this Agreement. The Department shall have the right to audit billings both before and after payment, and payment under this Agreement shall not foreclose the right of the Department to recover excessive or improper payments.
- F. Sponsor, upon payment of the amounts due under this Agreement, releases the Department, its officers and employees, and the State of Nebraska from all liabilities, claims, and obligations whatsoever arising from or under this Agreement.

6. Inspection During and After Construction.

The Director of the Department or his or her designated representative(s) shall have the privilege of inspecting the construction of the Project at any time in order to ensure that plans and specifications are being followed, that the works are being constructed in accordance with sound engineering and technical principles and practices, and that the Project continues to provide benefits as proposed in the Application. Such inspection shall never subject the State of Nebraska to any action for damages.

7. Project Completion Expected.

Sponsor shall provide and maintain adequate support, including the necessary professional or technical personnel and local funding identified in the Application to permit timely completion of the Project.

8. Independent Contractor.

- A. The relationship of the Department and Sponsor established by this Agreement is that of independent contractors. Nothing in this Agreement shall be construed in any manner as creating or establishing any agency or employment relationship between the Department and the Sponsor, or contractors of Sponsor.
- B. All claims on behalf of any person arising out of employment or alleged employment (including but not limited to claims of discrimination against the Sponsor, its officers, or its agents) shall in no way be the responsibility of the Department or the State. The Sponsor will hold the Department and the State harmless from any and all such claims. Sponsor personnel and all other persons acting for the Sponsor are not entitled to any reimbursements, rights, or benefits

from the Department or the State including but not limited to tenure rights, medical and hospital care, sick and vacation leave, severance pay, or retirement benefits.

9. Notices.

All notices, requests, demands, and other communications hereunder shall be in writing and delivered or mailed, with postage prepaid, to the Agreement Managers at the addresses set forth in Paragraph 4 of this Agreement.

10. Binding.

This Agreement shall inure to and bind the successors, assigns, and representatives of the Parties, providing, however, this Agreement may not be assigned by either Party without the prior written consent of the other. Neither the Department nor the Sponsor intends anyone to be a third-party beneficiary of this Agreement.

11. Entire Agreement/Severability/Waiver.

This Agreement is the entire agreement between the parties hereto; no representations, inducements, promises, or agreements, oral or otherwise, between the Parties not embodied herein shall be of any force or effect. In the event any provision of this Agreement shall be held invalid and unenforceable, the remaining provisions shall be valid and binding upon the Parties. One or more waivers by either Party of any provision, term, condition, or covenant shall not be construed by the other Party as a waiver of a subsequent breach of the same by the other Party.

12. Amendment of Agreement.

This Agreement may be amended only by a written instrument signed by the Department and the Sponsor.

13. Attachments.

If there are any terms and conditions contained in any Attachment hereto that are inconsistent with the terms and conditions contained in this Agreement, the terms and conditions of the Attachments shall be construed to conform to the terms of this Agreement unless specifically expressed in a writing signed by the Parties.

14. Prevailing Law.

This Agreement is governed by the laws of the State of Nebraska including the State Contract Claims Act, *Neb. Rev. Stat.* §§ 81-8,302 through 81-8,306.

15. Indemnification.

Neither the Department nor the State of Nebraska shall be liable for any damage or compensation payable with respect to or in consequence of any accident or injury to any workman or other person in the employment of the Sponsor that would be covered by Worker's Compensation insurance, liability insurance, or otherwise, except an accident

or injury resulting from an intentional act of the Department. The Sponsor shall indemnify, defend, and hold harmless the Department and the State of Nebraska against all such damages, compensation, and against all claims, proceedings, costs, charges, attorney's fees, and expenses whatsoever in respect thereof or in relation thereof. The Sponsor shall indemnify the Department and the State of Nebraska for any damages, claims, or liability to the extent caused by the Sponsor's negligent acts, errors, or omissions arising out of the performance of professional services under this Agreement. The Sponsor expressly waives all statutory or common law defenses, including but not limited to those under Workers' Compensation, Contribution, Comparative Fault or similar statutes or legal principles to the extent said defenses are inconsistent with or would defeat the purpose of the indemnification under this section.

16. Drug Free Work Place Policy.

Sponsor certifies that it maintains a drug free work place environment to ensure workers safety and workplace integrity. Sponsor agrees to provide a copy of its drug free workplace policy at any time upon request by the Department.

17. Technology Access.

Sponsor agrees to ensure compliance with Nebraska Access Technology Standards. See website at: <http://nitc.nebraska.gov/standards/2-201.pdf>. In the event that the State's technology access standards change during the term of the Agreement, the Department may create an amendment to the Agreement to ensure that it comply with the changed standard. If the amendment causes any changes in costs to the Sponsor, the costs shall be mutually agreed on by both Parties.

18. Fair Employment Practices.

Sponsor agrees to ensure compliance with the Nebraska Fair Employment Practice Act, which prohibits contractors of the State of Nebraska, and their subcontractors, from discriminating against any employee or applicant for employment, with respect to hire, tenure, terms, conditions, or privileges of employment because of race, color, religion, sex, disability, or national origin, *Neb. Rev. Stat.* §§ 48-1101 through 48-1125.

19. Worker Eligibility Status Requirements.

The Sponsor is required and hereby agrees to use a federal immigration verification system to determine the work eligibility status of any new employees paid with proceeds of this Agreement that are physically performing services within the State of Nebraska. The Sponsor understands and agrees that lawful presence in the United States is required for such employment and the Sponsor may be disqualified or the Agreement terminated if such lawful presence cannot be verified as required by *Neb. Rev. Stat.* § 4-108. A federal immigration verification system means the electronic verification of the work authorization program authorized by the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, 8 U.S.C. 1324a, known as the E-Verify Program, or an equivalent federal program designated by the United States Department of Homeland Security or other federal agency authorized to verify the work eligibility status of a newly hired employee.

ITEM 1a

20. Compliance with All Laws and Ordinances.

Sponsor covenants that it does and shall at all times pertinent to this Agreement comply with all state, federal, and local laws, ordinances and regulations including but not limited to corporate registration, payment of taxes and registration required for payment of taxes, and acquisition and payment for any permits, licenses, and approvals necessary for completion of the Project.

21. Audit Requirements.

All of the Sponsor's books, records, and documents relating to work performed or monies received under the Agreement shall be subject to audit at any reasonable time after reasonable notice by the Department. The Sponsor shall maintain all of these records for a period of five (5) years from the date of final payment, or until all issues related to an audit, litigation, or other action are resolved, whichever is longer. All records shall be maintained in accordance with generally accepted accounting principles.

22. Audit by Office of State Auditor.

Any public or private non-profit entity or political subdivision of the State serving as the recipient or sub-recipient of funds under this Agreement, except for an individual person, is subject to audit by the Office of State Auditor and must comply with requests for any information or records within three (3) business days after an the actual receipt of the request pursuant to *Neb. Rev. Stat.* § 84-304 (4)(a) and § 50-1213 (2).

23. Annual Report.

The Sponsor will annually submit to the Department's Agreement Manager, electronic reports on or before April 1st of each year up to and including the year final payment is made to the Project. Annual reports shall specify the reporting period and contain information detailing Project progress and the anticipated progress for the next year; and shall include some analysis of whether the Project is attaining its purposes as identified in the Application. After Project completion/close out, annual reports are no longer required unless real estate or other real property acquired or constructed as part of this Project is rented or otherwise generating revenue exclusive of park entry fees, city fees, or revenue not resulting from the Project.

24. Final Report

The Sponsor will electronically submit to the Department's Agreement Manager, a final report summarizing the results of the Project and discussing whether or not the benefits described in the Application were achieved or not.

IN WITNESS WHEREOF, the parties have executed this Agreement on the date last stated below.

Sponsor

ITEM 1a

By: _____

_____ Date _____

Nebraska Department of Natural Resources
By: Thomas E. Riley, P.E., Director
Department of Natural Resources
301 Centennial Mall South
P.O. Box 94676
Lincoln, NE 68509-4676

_____ Date _____

This Agreement signed in duplicate.

COOPERATIVE AGREEMENT

THIS COOPERATIVE AGREEMENT (the "Agreement") is made and entered into between the LOWER PLATTE SOUTH NATURAL RESOURCES DISTRICT ("DISTRICT"), acting as Administrator under an Interlocal Agreement identified in Exhibit "1", and the BOARD OF REGENTS OF THE UNIVERISTY OF NEBRASKA ON BEHALF OF THE UNIVERSITY OF NEBRASKA-LINCOLN CONSERVATION AND SURVEY DIVISION, SCHOOL OF NATURAL RESOURCES ("CSD"), collectively referred to herein as the "Parties."

WITNESSETH:

RECITALS

- A. The Parties have a mutual interest in the study and stewardship of the hydrogeologic and groundwater resources in Nebraska.
- B. The Parties desire to maintain a cooperative working arrangement to study the hydrogeologic and groundwater resources in Nebraska through the Water Sustainability Fund #5312 grant scope awarded December 15, 2021 to the DISTRICT on behalf of the Eastern Nebraska Water Resources Assessment (ENWRA).
- C. LPSNRD is acting as Administrator under the ENWRA Interlocal cooperative Agreement (ICA) attached hereto as Exhibit "1" and incorporated herein by this reference.

NOW THEREFORE, in consideration of the above recitals and the mutual promises and covenants contained herein, the Parties agree as follows:

1. **Effective Date.** The Parties agree that the Agreement will become effective upon the signature of both Parties.
2. **Term.** The term of the Agreement shall be from the effective date hereof through the end of calendar year 2024 (December 31, 2024). The Agreement may be terminated by either party at any time by giving sixty (60) days prior written notice to the other party. In the event that the term of the Agreement needs to be extended, an amendment shall be executed by both parties.
3. **Responsibilities of DISTRICT.** The DISTRICT agrees to the following:
 - (a) Administer the ICA (Exhibit "1") funding for CSD and other required subagreements/subcontracts on behalf of the participating Natural Resources Districts ("SPONSORS").
 - (b) Provide an agreement administration coordinator: Kristin Buntemeyer, Lower Platte South Natural Resources District, PO Box #83581, Lincoln, NE 68501-

ITEM 1b

3581, email address kbuntemeyer@lpsnrd.org.

- (c) LPSNRD will submit payment within 45 days of receipt of the CSD invoices, anticipated on a semi-annual frequency. LPSNRD policies do not allow payment of indirect costs. Anticipated fiscal year funding breakdown as follows:

	FY22	FY23	FY24	Total
Phase I Phase 2 and Phase 3 Activities	\$20,401	\$42,911	\$22,204	\$85,516
Domestic Travel And Supplies	\$1,650	\$1,000	\$834	\$3,484
TOTALS:	\$22,051	\$43,911	\$23,038	\$89,000

4. Responsibilities of CSD. CSD agrees to the following:

- (a) Lead the Groundwater Recharge Mapping and Focus Area Assessments (Project) in cooperation with the U.S. Geological Survey and participating SPONSORS.
- (b) Invoice the DISTRICT on a semi-annual basis, not more than \$89,000 throughout the term of the agreement herein, for the NGC as outlined in DISTRICTS annual fiscal budgets as per the table shown in 3.(c) above.

5. Amendments. The Agreement may only be amended in writing signed by the Parties.

IN WITNESS WHEREOF the Parties have executed the Agreement by their authorized representatives on the date show below.

LOWER PLATTE SOUTH NATURAL RESOURCES DISTRICT, as Administrator, acting on behalf of the participating DISTRICTS under an Interlocal Agreement attached as Exhibit "1" hereto.

By: _____
Paul D. Zillig

Title: General Manager

Date: _____

CONSERVATION AND SURVEY DIVISION

By: _____
Robert M. Joeckel

Title: Director

Date: _____

UNIVERSITY OF NEBRASKA

By: _____

Title: Director of Sponsored Programs

Date: _____

DRAFT

United States Department of the Interior
U.S. GEOLOGICAL SURVEY
Nebraska Water Science Center 5231 South 19th Street
Lincoln, NE 68512-1271

h

January 2022

Paul Zillig
Lower Platte South Natural Resources District
P.O. Box 83581
Lincoln, NE 68509-4676 Dear Mr. Zillig:

Enclosed are two copies of Joint Funding Agreement No. XXXXXX for the ENWRA ENWRA Groundwater Recharge Mapping and Focus Area Assessments (Project). The total amount of the agreement is \$225,000 or \$74,000 for the U.S. Geological Survey and \$151,000 for the Lower Platte South Natural Resources District. Please sign one copy of the agreement and return it to this office as soon as possible. Work cannot be started until we receive the signed agreement.

Work performed with funds from the agreement will be conducted on a fixed-price basis under the authority of statute 43 USC 50. Billings will be rendered quarterly. The results of all work under the agreement will be available for publication by the U.S. Geological Survey.

Please contact XXXXXX at 402-XXX XXXX if you have any questions concerning this agreement.

USGS Nebraska Water Science Center

2 Enclosures

DUNS No. 949286512

Form 9-1366
(April 2015)

U.S. DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Customer #: 600000121
Agreement #: ~~XXXXXX~~
Project #: ~~XXXXXX~~

JOINT FUNDING AGREEMENT

TIN #: 47-0542969
Fixed Cost

FOR
WATER RESOURCES INVESTIGATIONS

THIS AGREEMENT is entered into as of the, 1st day of ~~XXXXXX~~ by the U.S. GEOLOGICAL SURVEY, UNITED STATES DEPARTMENT OF THE INTERIOR, party of the first part, and the Lower Platte South Natural Resources District, party of the second part.

1. The parties hereto agree that subject to availability of appropriations and in accordance with their respective authorities there shall be maintained in cooperation, the ENWRA Groundwater Recharge Mapping and Focus Area Assessments (Project), herein called the program. The USGS legal authority is 43 USC 36C; 43 USC 50; and 43 USC 50b.

2. The following amounts shall be contributed to cover all of the cost of the necessary field and analytical work directly related to this program. 2(b) includes In-Kind Services in the amount of \$0.00

(a) by the party of the first part during the period

Amount	Date	Date
\$49,500.00	January 19, 2022	December 31, 2024

(b) by the party of the second part during the period

Amount	Date	to	Date
\$151,000.00	January 19, 2022		December 31, 2024

Contributions are provided by the party of the first part through other USGS regional or national programs, in the amount of: \$0.00

Description of the USGS regional/national program:

Additional or reduced amounts by each party during the above period or succeeding periods as may be determined by mutual agreement and set forth in an exchange of letters between the parties. The performance period may be changed by mutual agreement and set forth in an exchange of letters between the parties.

The costs of this program may be paid by either party in conformity with the laws and regulations respectively governing each party.

The field and analytical work pertaining to this program shall be under the direction of or subject to periodic review by an authorized representative of the party of the first part.

The areas to be included in the program shall be determined by mutual agreement between the parties hereto or their authorized representatives. The methods employed in the field and office shall be those adopted by the party of the first part to insure the required standards of accuracy subject to modification by mutual agreement.

During the course of this program, all field and analytical work of either party pertaining to this program shall be open to the inspection of the other party, and if the work is not being carried on in a mutually satisfactory manner, either party may terminate this agreement upon 60 days written notice to the other party.

9-1366 (Continuation) Customer #: 600000121 Agreement #: XXXXXX

The original records resulting from this program will be deposited in the office of origin of those records. Upon request, copies of the original records will be provided to the office of the other party. The maps, records, or reports resulting from this program shall be made available to the public as promptly as possible. The maps, records, or reports normally will be published by the party of the first part. However, the party of the second part reserves the right to publish the results of this program and, if already published by the party of the first part shall, upon request, be furnished by the party of the first part, at costs, impressions suitable for purposes of reproduction similar to that for which the original copy was prepared. The maps, records, or reports published by either party shall contain a statement of the cooperative relations between the parties. USGS will issue billings utilizing Department of the Interior Bill for Collection (form DI-1040). Billing documents are to be rendered QUARTERLY. Payments of bills are due within 60 days after the billing date. If not paid by the due date, interest will be charged at the current Treasury rate for each 30 day period, or portion thereof, that the payment is delayed beyond the due date. (31 USC 3717; Comptroller General File B-212222, August 23, 1983).

U.S. Geological Survey United States Department of the Interior USGS Point of Contact	Lower Platte South Natural Resources District Customer Point of Contact
Name XXXXXX Phone	Name: Katie Cameron Phone 402.476.2729

INTERLOCAL COOPERATIVE AGREEMENT

BETWEEN THE

**LEWIS & CLARK NATURAL RESOURCES DISTRICT
LOWER ELKHORN NATURAL RESOURCES DISTRICT
LOWER PLATTE NORTH NATURAL RESOURCES DISTRICT
LOWER PLATTE SOUTH NATURAL RESOURCES DISTRICT
NEMAHA NATURAL RESOURCES DISTRICT
PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT
LOWER LOUP NATURAL RESOURCES DISTRICT
UPPER ELKHORN NATURAL RESOURCES DISTRICT
MIDDLE REPUBLICAN NATURAL RESOURCES DISTRICT
CENTRAL PLATTE NATURAL RESOURCES DISTRICT**

THIS AGREEMENT is made and entered into this ____ day of _____, 2020, by and between the between the Lower Platte South Natural Resources District (“LPSNRD”) on behalf of the Eastern Nebraska Water Resources Assessment Natural Resources Districts: Lewis & Clark Natural Resources District (“LCNRD”), Lower Elkhorn Natural Resources District (“LENRD”), Lower Platte North Natural Resources District (“LPNNRD”), Nemaha Natural Resources District (“NNRD”), Papio-Missouri River Natural Resources District (“P-MRNRD”) and the Lower Loup Natural Resources District (“LLNRD”), Upper Elkhorn Natural Resources District (“UENRD”), Middle Republican Natural Resources District (“MRNRD”), and Central Platte Natural Resources District (“CPNRD”), hereinafter referred to individually as “each District” or the individual District’s initials, for example, LPSNRD, or collectively as the “DISTRICTS” .

WITNESSETH:

RECITALS

A. The DISTRICTS are political subdivisions of the State of Nebraska organized and existing pursuant to *Neb. Rev. Stat.* §§ 2-3201, et seq., and have the authority, pursuant to *Neb. Rev. Stat.* § 2-3232(1), to make studies, investigations, or surveys and do research as may be necessary to carry out its authorized purposes, enter upon any land, after notifying the owner or occupier, for the purpose of conducting such studies, investigations, surveys, and research, and publish and disseminate the results.

B. Among the authorized purposes of the DISTRICTS, pursuant to *Neb. Rev. Stat.* § 2-3229, are water supply for any beneficial uses, and the development, management, utilization, and conservation of ground water and surface water.

C. The State or any local government may exercise any of its powers or perform any of its functions jointly or in cooperation with any other governmental entity as authorized by Article XV § 18 of the Nebraska Constitution. Any two or more public agencies (county, city, village, school district, agency of the State government, or political subdivision of this State) are authorized by *Neb. Rev. Stat.* §§ 13-801 to 13-827 to enter into interlocal agreements with one another for joint or cooperative action for any power or powers, privileges or authorities exercised or capable of exercise individually by such public agencies.

D. The DISTRICTS have a mutual interest in the study and stewardship of the hydrogeologic and groundwater resources in Nebraska.

E. The DISTRICTS, through a previous cooperative arrangement and Water Sustainability Fund (“WSF”) grant award (WSF#4164 - *the Nebraska GeoCloud and Airborne Electromagnetic [AEM] Data Integration*), have established the Nebraska GeoCloud platform (“NGC”) implemented by the University of Nebraska Conservation and Survey Division, School of Natural Resources (“CSD”), the U.S. Geological Survey, United States Department Of The Interior (“USGS”) and Nebraska’s Natural Resources Districts (“NRDs”). The **Project partners** are at the **“publish and disseminate the results” stage of the NGC cooperative effort (Exhibit “A”)**. The DISTRICTS, CSD and USGS are also approaching the end of the previous NGC agreement term (term closes June 30, 2022).

F. The DISTRICTS desire to establish this interlocal cooperative agreement (“ICA”), hereinafter referred to as “NGC ICA”, to sustain and maintain the AEM and supporting geologic data compiled under the NGC Platform investment for the next **five** years beyond June 30, 2022. The NGC Platform requires server storage space, internet access and support from the NGC development team to facilitate data requests, potential NGC upload/download/input/output issues and continue outreach/workshop activities. Exhibit “A” attached to, and incorporated herein, by this reference further describes the NGC accomplishments and portal resources designed for federal, state and local agencies, the public, and the private sector.

NOW, THEREFORE, in consideration of the above Recitals and the mutual promises and covenants contained herein, the DISTRICTS agree as follows:

ARTICLE I

OBJECTIVES AND PURPOSES

Section 1.01

The objective and purpose of this NGC ICA is to establish a single uniform framework to provide **\$115,000** for funding the NGC, **\$23,000 per year for the next 5 years**. The DISTRICTS will budget funds (individual DISTRICT funds) for Fiscal Years (July 1 to June 30) (FY) 2023 and FY 2027, all as shown in the table in Section 4.01.

Section 1.02

In order to attain the objective and purpose of this NGC ICA, each District shall perform its obligations and commitment under this Agreement in good faith and shall cooperate with the other DISTRICTS.

ARTICLE II

TERM OF AGREEMENT

Section 2.01

This NGC ICA shall become effective and binding upon its approval by appropriate action of the governing bodies of each District pursuant to *Neb. Rev. Stat.* § 13-1804(2) and execution by all of the DISTRICTS.

Section 2.02

Each District hereby agrees to participate with the other DISTRICTS in the conduct of the activities hereinafter described.

Section 2.03

In the event that a District fails to perform its obligations and commitments pursuant to this NGC ICA, the other DISTRICTS either individually or jointly, may legally seek to enforce such obligations and commitments in the appropriate court of law.

Section 2.04

The term of this NGC ICA shall begin on the date of the last signatory District and continue until the end of the DISTRICTS FY2027 (June 30, 2027), unless further extended by the mutual agreement of all DISTRICTS. This NGC ICA shall survive a transition of the form of government of a District from one form to another. In the event that one or more Districts fails to perform their financial obligation and commitment under this Agreement, the remaining Districts, in addition to taking legal action to recover amounts in default, may at their option continue with the NGC for the remainder of the ICA term.

ARTICLE III

AGREEMENT ADMINISTRATION

Section 3.01

The NGC ICA Coordinator, is Kathleen Cameron: located at LPSNRD, PO Box #83581, Lincoln, NE 68501-3581, kcameron_enwra@lpsnrd.org, and will serve as the contact person for the overall coordination of the DISTRICTS' FY2023 to FY2027 financial obligation and commitment. .

Each District will provide a contact person to receive communications and local invoices related to the NGC ICA from the NGC ICA Coordinator.

Section 3.02

This Agreement does not establish a separate joint or legal entity. LPSNRD shall act as Administrator of the NGC ICA and shall be responsible for the administration of all funds (receivable and payable) and shall enter into all subcontracts/subagreements necessary to achieve the **ARTICLE 1 Objectives and Purposes** in its name as NGC ICA Administrator.

Section 3.03

The NGC ICA Coordinator shall obtain pre-approval for and subsequently provide copies of all NGC team subagreements/subcontracts under the NGC ICA to each District.

Section 3.04

Each District shall be responsible for the negligent acts or omissions of its own employees and shall not be responsible for the negligent acts or omissions of other DISTRICTS employees.

Section 3.05

LPSNRD shall prepare and send at the beginning of each FY a statement of the shared costs to be incurred for the upcoming FY for the NGC ICA for each District and each District shall pay its share of the costs within 45 days of the receipt of such statement.

Section 3.06

LPSNRD shall prepare and send to each District within 45 days of the close of each FY, a summary of the receipts and expenses of the NGC ICA.

ARTICLE IV

FUNDING

Section 4.01

Each District will budget funds for fiscal year FY2023 through FY2027 as follows:

Financial Sponsors	FY23	FY24	FY25	FY26	FY27	Total
LLNRD	\$2,400	\$2,400	\$2,400	\$2,400	\$2,400	\$12,000
UENRD	\$800	\$800	\$800	\$800	\$800	\$4,000
CPNRD	\$2,400	\$2,400	\$2,400	\$2,400	\$2,400	\$12,000
MRNRD	\$2,400	\$2,400	\$2,400	\$2,400	\$2,400	\$12,000
ENWRA (LCNRD, LENRD, LPNNRD, LPSNRD, NNRD, P-MRNRD)	\$15,000	\$15,000	\$15,000	\$15,000	\$15,000	\$75,000
TOTALS	\$23,000	\$23,000	\$23,000	\$23,000	\$23,000	\$115,000

ARTICLE V

POWERS

Section 5.01

The DISTRICTS shall have all of the powers and authorities pursuant to state statutes that are necessary to carryout the stated objective and purpose on behalf of the NGC ICA joint and cooperative effort.

Section 5.02

Each District shall have such other powers as are authorized under the Nebraska statutes that establish each such District, and under the Interlocal Cooperation Act, *Neb.*

Rev. Stat. §§ 13-801 to 13-827, which are necessary and proper for the achievement of the stated objective and purpose as set forth in this NGC ICA.

Section 5.03

In every contract to which the state or any of its political subdivisions is a party, it shall contain a provision requiring the contractor and his or her subcontractors not to discriminate against any employee, or applicant for employment, to be employed in the performance of such contract, with respect to his or her hire, tenure, terms, conditions, or privileges of employment, because of his or her race, color, religion, sex, disability, or national origin, in accordance with the Nebraska Fair Employment Practices Act, *Ne. Rev. Stat. Section 48-1122, as amended*. The Districts are all political subdivisions of the State of Nebraska and therefore this provision is required to be included as a provision of this Agreement.

ARTICLE VI

AMENDMENTS

Section 6.01

Any District may propose an amendment to this NGC ICA by submitting it in writing to the other DISTRICTS, which shall immediately consider in good faith the proposed amendment; provided, however, that no such amendment shall, directly or indirectly, affect or impair any written contracts or agreements entered into prior to the effective date of such amendment.

Section 6.02

No amendment or other modification to this NGC ICA shall be effective unless it is in writing and approved by all DISTRICTS. Such amendment shall become effective after all DISTRICTS have approved and executed the same.

Section 6.03

This agreement may be executed in two or more counterparts, each of which shall be an original but all of which shall constitute one and the same instrument. This Agreement is hereby approved and executed by the following DISTRICTS on the dates shown below.

IN WITNESS WHEREOF, each District has caused this NGC ICA to be executed by its duly authorized officer as of the date and year shown below.

LOWER PLATTE SOUTH NATURAL RESOURCES DISTRICT

BY: _____
DATE:_____

LOWER LOUP NATURAL RESOURCES DISTRICT

BY: _____
DATE:_____

UPPER ELKHORN NATURAL RESOURCES DISTRICT

BY: _____
DATE:_____

CENTRAL PLATTE NATURAL RESOURCES DISTRICT

BY: _____
DATE:_____

MIDDLE REPUBLICANNATURAL RESOURCES DISTRICT

BY: _____
DATE:_____

COOPERATIVE AGREEMENT

THIS COOPERATIVE AGREEMENT (the "Agreement") is made and entered into between the LOWER PLATTE SOUTH NATURAL RESOURCES DISTRICT ("DISTRICT"), acting as Administrator under an Interlocal Agreement identified in Exhibit "1", and the BOARD OF REGENTS OF THE UNIVERISTY OF NEBRASKA ON BEHALF OF THE UNIVERSITY OF NEBRASKA-LINCOLN CONSERVATION AND SURVEY DIVISION, SCHOOL OF NATURAL RESOURCES ("CSD"), collectively referred to herein as the "Parties."

WITNESSETH:

RECITALS

- A. The Parties have a mutual interest in the study and stewardship of the hydrogeologic and groundwater resources in Nebraska.
- B. The Parties desire to maintain a cooperative working arrangement to enhance the study and stewardship of the hydrogeologic and groundwater resources in Nebraska through the continued hosting of Nebraska GeoCloud ("NGC") Platform created under the previous mutual agreement between the parties dated March 30, 2017 and amended extension dated May 14, 2020.
- C. LPSNRD is acting as Administrator under the Interlocal cooperative Agreement (ICA) attached hereto as Exhibit "1" and incorporated herein by this reference.

NOW THEREFORE, in consideration of the above recitals and the mutual promises and covenants contained herein, the Parties agree as follows:

1. **Effective Date.** The Parties agree that the Agreement will become effective upon the signature of both Parties.
2. **Term.** The term of the Agreement shall be from the effective date hereof through the end of LPSNRD fiscal year 2027 (June 30, 2027) with the understanding that a 5 year renewal periods are planned thereafter as long as the NGC remains a viable source of statewide hydrogeologic datasets for Nebraska. The Agreement may be terminated by either party at any time by giving sixty (60) days prior written notice to the other party. In the event that the term of the Agreement needs to be extended, an amendment shall be executed by both parties.
3. **Responsibilities of DISTRICT.** The DISTRICT agrees to the following:
 - (a) Administer the ICA (Exhibit "1") funding for CSD and other required subagreements/subcontracts on behalf of the participating Natural Resources Districts ("SPONSORS").
 - (b) Provide an agreement administration coordinator: Kristin Buntemeyer, Lower

Item 2b

Platte South Natural Resources District, PO Box #83581, Lincoln, NE 68501-3581, email address kbuntemeyer@lpsnrd.org.

(c) LPSNRD will submit payment within 45 days of receipt of the CSD invoices, anticipated on a semi-annual frequency. LPSNRD policies do not allow payment of indirect costs. Anticipated fiscal year funding breakdown as follows:

	FY23	FY24	FY25	FY26	FY27	Total
CSD (workshops, travel, NGC operations, coordination)	\$3,000	\$3,000	\$3,000	\$3,000	\$3,000	\$15,000
I-GIS Subagreement (server storage, portal maintenance, Nebraska Viewer licenses)	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$100,000
TOTALS:	\$23,000	\$23,000	\$23,000	\$23,000	\$23,000	\$115,000

(d) The overarching ICA (Exhibit 1) providing \$115,000.00 in sponsorship dollars to ENWRA for the 5-year continuance of this agreement is necessary for the DISTRICT’S administration of the funds.

4. Responsibilities of CSD. CSD agrees to the following:

- (a) Lead the NGC (through Professional Services agreements with 1-GIS, includes providing users access to the data) in cooperation with the participating SPONSORS.
- (b) Invoice the DISTRICT on a semi-annual basis, not more than \$115,000 throughout the term of the agreement herein, for the NGC as outlined in DISTRICTS annual fiscal budgets as per the table shown in 3.(c) above.

5. Amendments. The Agreement may only be amended in writing signed by the Parties.

IN WITNESS WHEREOF the Parties have executed the Agreement by their authorized representatives on the date show below.

LOWER PLATTE SOUTH NATURAL RESOURCES DISTRICT, as Administrator, acting on behalf of the participating DISTRICTS under an Interlocal Agreement attached as Exhibit “1” hereto.

By: _____
Paul D. Zillig

Title: General Manager

Date: _____

CONSERVATION AND SURVEY DIVISION

By: _____
Robert M. Joeckel

Title: Director

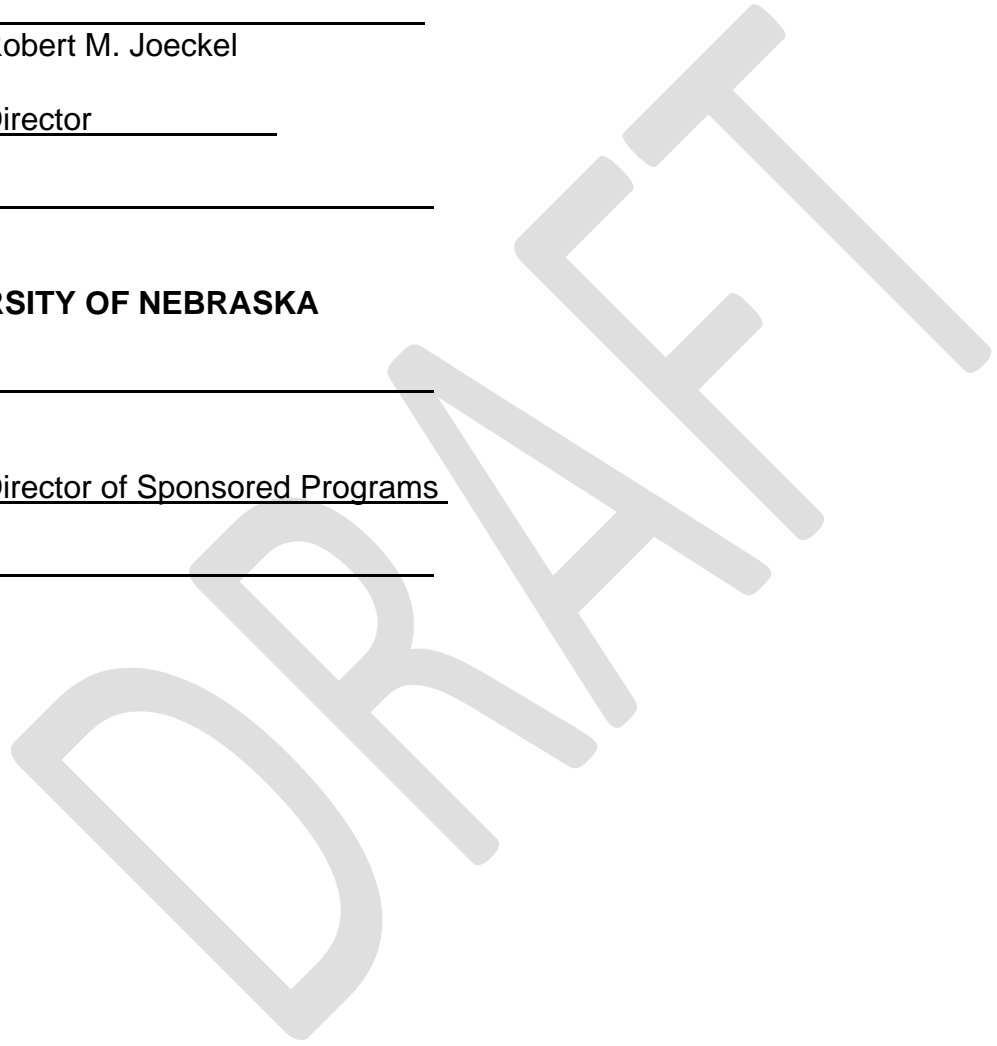
Date: _____

UNIVERSITY OF NEBRASKA

By: _____

Title: Director of Sponsored Programs

Date: _____



INTERLOCAL COOPERATIVE AGREEMENT

BETWEEN THE

**LEWIS & CLARK NATURAL RESOURCES DISTRICT
LOWER ELKHORN NATURAL RESOURCES DISTRICT
LOWER PLATTE NORTH NATURAL RESOURCES DISTRICT
LOWER PLATTE SOUTH NATURAL RESOURCES DISTRICT
NEMAHA NATURAL RESOURCES DISTRICT and
PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT**

AMENDMENT #7

THIS AMENDMENT #7 is made and entered into by and between the above natural resources district this ____ day of _____, 2022. The natural resources districts are hereinafter referred to collectively as the Districts. This Amendment supplements the original agreement effective as of January 18, 2007, and Amendments #1, #2, #3, #4, #5 and #6 effective as of April 28, 2020.

Modification #1: Article III, Section 3.02, as modified in Amendment #1, Modification #1, Amendment #4, Modification #1, Amendment #5, Modification #1, and Amendment #6, Modification #1:

The “Exhibit A” Cooperative Agreement references related to the coordinator position shall refer to the Amended Cooperative Agreement for the July 1, 2022 - June 30, 2027 term, attached hereto.

Modification #2: Article V, Section 5.02-5.03, original agreement, as modified in Amendment #1, Modification #3, Amendment #3, Modification #2 and Amendment #5, Modification #2:

These sections shall be changed to read:

Item 3

The Districts shall contribute funding for the project for the entire term of the agreement which now terminates on June 30, 2027, unless further extended by mutual agreement of all Districts. The

Districts agree that funding for the fiscal year (FY) 2023 through FY 2027 will be as follows:

	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
LCNRD	\$9,150	\$9,150	\$9,150	\$9,150	\$9,150
NNRD	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000
PMRNRD	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000
LENRD	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000
LPSNRD	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000
LPNNRD	\$30,000	\$30,000	\$30,000	\$30,000	\$30,000
Total	\$149,150	\$149,150	\$149,150	\$149,150	\$149,150

LEWIS AND CLARK NATURAL RESOURCES DISTRICT

BY: _____

DATE: _____

LOWER ELKHORN NATURAL RESOURCES DISTRICT

BY: _____

DATE: _____

LOWER PLATTE NORTH NATURAL RESOURCES DISTRICT

BY: _____

DATE: _____

LOWER PLATTE SOUTH NATURAL RESOURCES DISTRICT

BY: _____

DATE: _____

LOWER PLATTE NORTH NATURAL RESOURCES DISTRICT

BY: _____

DATE: _____

PAPIO-MISSOURI RIVER NATURAL RESOURCES DISTRICT

BY: _____

DATE: _____

COOPERATIVE AGREEMENT

THIS COOPERATIVE AGREEMENT (the "Agreement") is made and entered into between the LOWER PLATTE SOUTH NATURAL RESOURCES DISTRICT ("DISTRICT"), acting as Administrator under an Interlocal Agreement identified in Exhibit "A", and the BOARD OF REGENTS OF THE UNIVERISTY OF NEBRASKA ON BEHALF OF THE UNIVERSITY OF NEBRASKA-LINCOLN CONSERVATION AND SURVEY DIVISION, SCHOOL OF NATURAL RESOURCES ("CSD"), collectively referred to herein as the "Parties."

WITNESSETH:

RECITALS

- A. The Parties have a mutual interest in the study and stewardship of the geologic and groundwater resources in eastern Nebraska.
- B. The Parties desire to maintain a cooperative working arrangement to enhance the study and stewardship of the geologic and groundwater resources in eastern Nebraska.
- C. DISTRICT and CSD programs have the potential to significantly enhance the study and stewardship of the geologic and groundwater resources in eastern Nebraska.

NOW THEREFORE, in consideration of the above recitals and the mutual promises and covenants contained herein, the Parties agree as follows:

1. **Effective Date.** The Parties agree that the Agreement will become effective upon the signature of both Parties.
2. **Term.** The term of the Agreement shall be for five (5) years from the effective date; provided however, that it may be terminated by either party at any time by giving sixty (60) days prior written notice to the other party. In the event that the term of the Agreement needs to be extended, an amendment shall be executed by both parties.
3. **Responsibilities of DISTRICT.** The DISTRICT agrees to the following:
 - (a) Set general accomplishment goals and priorities for the assigned geologist/hydrogeologist, in consultation with the CSD
 - (b) Provide input to CSD on the hiring/assignment of a qualified geologist/hydrogeologist.
 - (c) Participate in the development of annual work plans and program evaluations for the assigned geologist/hydrogeologist.

- (d) Provide 60% of the salary and benefits plus annual operating expenses of up to \$6,250 for the assigned geologist/hydrogeologist. DISTRICT policies do not allow payment of indirect costs.
- (e) Provide office space, clerical support, and office supplies/equipment for the assigned geologist/hydrogeologist.
- (f) Submit appropriate reports to CSD.
- (g) Function as the administrative representative of the Eastern Nebraska Water Resources Assessment. (ENWRA)

4. Responsibilities of CSD. CSD agrees to the following:

- (a) Hire and assign a qualified geologist/hydrogeologist to work full-time on geologic and groundwater related activities and/or projects pertaining to eastern Nebraska.
- (b) Invoice the DISTRICT on a semi-annual basis for 60% of the assigned geologist/hydrogeologist salary and benefits plus annual operating expenses of up to \$6,250 (based on the July 1 through June 30 fiscal year). CSD is responsible for 40% of salary and benefits.
- (c) Use the DISTRICT and CSD funding agreed upon within this agreement to provide a vehicle and to cover travel expenses for the assigned geologist/hydrogeologist.
- (d) Acquire additional funding, if necessary, to provide specialized equipment and supplies for the assigned geologist/hydrogeologist.
- (e) Submit an annual budget for the assigned geologist/hydrogeologist to the DISTRICT by May 1 of each year.

5. Duties of the Assigned Geologist/Hydrogeologist. The geologist/hydrogeologist assigned under the Agreement will be required to perform the following tasks:

- (a) Focus on geologic and groundwater resources in eastern Nebraska.
- (b) Provide technical geologic and groundwater resource services to rural and urban cooperators within eastern Nebraska.
- (c) Prepare and provide educational materials and compile, record, and publish information on the geology and groundwater resources of eastern Nebraska.
- (d) Submit appropriate work plans and accomplishment reports to CSD and the DISTRICT.

(e) Provide technical and coordinator support to the Eastern Nebraska Water Resources Assessment.

(f) Obtain supervision from the Director of the Conservation and Survey Division.

6. **Amendments.** The Agreement may only be amended in writing signed by the Parties.

IN WITNESS WHEREOF the Parties have executed the Agreement by their authorized representatives on the date show below.

**LOWER PLATTE SOUTH
NATURAL RESOURCES DISTRICT, as Administrator, acting on behalf of the
participating DISTRICTS under an Interlocal Agreement attached as Exhibit "A" hereto.**

By: _____
Paul D. Zillig

Title: General Manager

Date: _____

CONSERVATION AND SURVEY DIVISION

By: _____
Robert M. Joeckel

Title: Director

Date: _____

UNIVERSITY OF NEBRASKA

By: _____
Jeanne Wicks

Title: Director of Sponsored Programs

Date: _____

Lower Platte South Natural Resources District Cooperative Agreement – BUDGET

Budget Category	YEAR ONE <u>(July 1, 2022 to June 30, 2023)</u>	TOTAL YEAR ONE
Personnel		
Salary	65,488	65,488
Benefits	19,646	19,646
Total Personnel	85,134	85,134
Travel	3,125	3,125
Supplies	350	350
Operating	2,775	2,775
Total Direct Costs	6,250	6,250
Total	91,384	91,384

Budget justification: Salary will be used to support a geologist/hydrogeologist. Travel is for field work and for attendance at service/educational activities and meetings. Supplies are for software needed for model development and data analysis and various small laboratory and field supplies needed to complete the project. No equipment will be purchased as part of this project.

ENWRA

EASTERN NEBRASKA WATER RESOURCES ASSESSMENT

www.enwra.org

Please visit our show room Tuesday afternoon

Nebraska GeoCloud: A Statewide Web Tool for:
geophysics • geology • GIS • download • upload • discovery

The screenshot shows the Nebraska GeoCloud web tool interface. On the left, there is a sidebar with a search bar and a list of data layers. The main area displays a map of Nebraska with various data layers overlaid. On the right, there is a panel titled "Files for 'Hastie GMA 2016'" with a list of downloadable files:

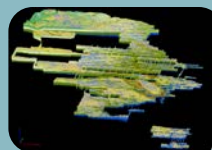
- Download BGMA_2016_Report_v1.pdf (45.9 MB)
- Download BGMA_2016_RawData.zip (738.6 MB)
- Download BGMA_2016_Interp_Supp.zip (17.1 MB)
- Download BGMA_2016_Metadata.pdf (414.5 KB)



Drill



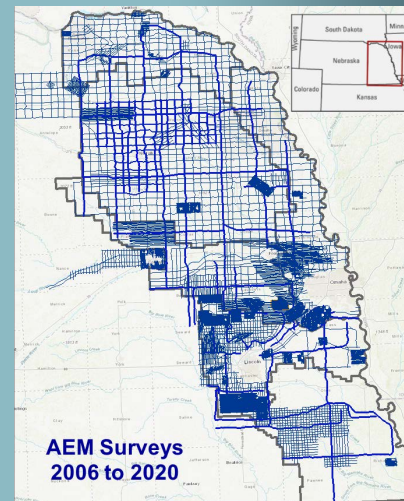
Monitor



Interpret



Fly



AEM Surveys
2006 to 2020

A collection of logos for partner organizations and agencies involved in the assessment. The logos include:

- LOWER PLATTE NORTH Natural Resources District
- LOWER PLATTE SOUTH
- LEWIS & CLARK NRD
- LOWER ELKHORN Natural Resources District
- NEMA
- AGF
- USGS
- NEBRASKA Good Life. Great Water. DEPT. OF NATURAL RESOURCES

INVOICE

Date: December 14, 2021



Lower Platte River
CORRIDOR ALLIANCE

Lower Platte River Corridor Alliance
3125 Portia Street
P.O. Box 83581
Lincoln, NE 68501
402-476-2729
dpotter@lpsnrd.org

TO Lower Platte North NRD
c/o Eric Gottschalk
511 Commercial Park RD
Wahoo, NE 68066

DESCRIPTION	TOTAL
FY22 USGS Real-Time Water Quality Monitoring - Leshara (as per Joint Funding Agreement)	\$6,562.00
TOTAL DUE	\$6,562.00

Make all checks payable to Lower Platte South Natural Resources District or electronic submissions can be arranged.
Please note "LPRCA" in MEMO section on check if applicable.

If you have any questions concerning this invoice, contact David Potter, LPSNRD Assistant Manager at (402) 476-2729

JOINT FUNDING AGREEMENT

For

REAL-TIME CONTINUOUS WATER QUALITY MONITORING

in the LOWER PLATTE RIVER AT LESHARA

The "JOINT FUNDING AGREEMENT—REAL-TIME CONTINUOUS WATER QUALITY MONITORING in the PLATTE RIVER AT LESHARA" (hereinafter referred to as "the Agreement") to be executed by and among the Lower Platte South Natural Resources District, on behalf of the Lower Platte River Corridor Alliance and _____ (herein after referred to as "the Partners").

The Partners agree as follows.

Scope of work

Real-time continuous water quality monitoring data will be collected by USGS personnel and equipment in the Platte River near Leshara. Water quality data to be collected include temperature, turbidity, dissolved oxygen, specific conductance, nitrate/nitrite and others as available. Data will be displayed in real-time over the internet. The data is anticipated to be collected generally March through October in 2022, 2023 and 2024.

Funding

The Lower Platte South Natural Resources District, on behalf of the Lower Platte River Corridor Alliance, will hold and disburse funds from all Partners as needed for this study. The _____ will provide \$6,400.00 in 2022 (FY23), \$5,320.00 in 2023 (FY24), and \$4,360.00 in 2024 (FY25) for a total of \$16,080 for the three-year agreement. The Lower Platte River Corridor Alliance will pay the balance of the annual fee for the monitoring agreement (four other partners paying equal amounts).

Effective date

The agreement shall become effective upon execution by all parties.

Duration of agreement

The agreement shall run through the end of calendar year 2024 when all required funds have been received and data collection completed.

This Agreement is hereby approved and executed by the following parties on the dates shown below.

Paul Zillig, General Manager LPSNRD

DATE

DATE

DRAFT

USGS Water Quality Gages on the Platte River near Leshara

- 1) The USGS Nebraska Water Science Center in addition to several cooperators are interested in extending the agreement for continuous water quality monitoring at the Platte River near Leshara gage. Beginning in April, 2016 a continuous water quality monitor was deployed in the Platte River near Leshara to help get additional water quality information in the upper portions of the Lower Platte River. This site has a joint agreement with several cooperators. This site's operation is similar to data collected at other USGS-Lower Platte River monitoring sites.
- 2) Water quality information collected at this site helps:
 - a) Monitoring in support of the Lower Platte River's Water Quality Management Plan
 - b) Potential to identify the water-quality impacts from management and land use changes in the contributing basin as well as to provide a baseline for future comparisons.
 - c) Assessing the stream health for fisheries
 - d) Better characterization of nitrate concentration in the drinking water source of many Nebraskans.
 - e) Inform those who use the river for recreating of potential water quality risks
 - f) Development of surrogate estimates to help better quantify loads of non-monitored parameters.
 - i) Assess the stream health for both immediate concentrations and loads heading downstream
 - g) Understand nitrate concentrations above the shallow aquifers used for drinking water
- 3) The water quality gage at the Platte River Leshara has been a multi-cooperative agreement.
 - a) Funds contributed by Lower Platte South NRD, Lower Platte North NRD, Papio-Missouri NRD, Lincoln Water Systems, M.U.D, and USGS
 - b) For the 2022-2024 data collection the USGS contributes 30% of the total cost, Papio, LPS, LPN, , LWS, and M.U.D c split the remaining funds.
- 4) The current agreement runs from April 30, 2019 to June 30, 2022. This covers data collection for the 2019-2021 calendar years. A proposed extension to this agreement would cover data collection for the years of 2022-2024. Funding below assumes that all parties would still be interested in operating the gage with the same scope for an additional three years beyond the 2021 data collection year. Please see Table 2 for a detailed breakout of charges.

Table 1:

	Federal Fiscal Year 2022	Federal Fiscal Year 2023	Federal Fiscal Year 2024	Federal Fiscal Year 2025	Total
USGS	\$7,200	\$9,600	\$10,000	\$3,600	\$30,400
Partners	\$19,000	\$26,000	\$27,200	\$8,200	\$80,400

Table 2:

Agreement # **16EMNE000210**

Billing Date	Total Amount	Federal Fiscal Year	LPN NRD	LPS NRD	Papio-M NRD	LWS	M.U.D.	USGS
6/30/2022	\$13,100	2022	\$1,900	\$1,900	\$1,900	\$1,900	\$1,900	\$3,600
8/31/2022	\$13,100	2022	\$1,900	\$1,900	\$1,900	\$1,900	\$1,900	\$3,600
12/31/2022	\$8,900	2023	\$1,300	\$1,300	\$1,300	\$1,300	\$1,300	\$2,400
3/31/2023	\$8,900	2023	\$1,300	\$1,300	\$1,300	\$1,300	\$1,300	\$2,400
6/30/2023	\$8,900	2023	\$1,300	\$1,300	\$1,300	\$1,300	\$1,300	\$2,400
8/31/2023	\$8,900	2023	\$1,300	\$1,300	\$1,300	\$1,300	\$1,300	\$2,400
12/31/2023	\$9,300	2024	\$1,360	\$1,360	\$1,360	\$1,360	\$1,360	\$2,500
3/31/2024	\$9,300	2024	\$1,360	\$1,360	\$1,360	\$1,360	\$1,360	\$2,500
6/30/2024	\$9,300	2024	\$1,360	\$1,360	\$1,360	\$1,360	\$1,360	\$2,500
8/31/2024	\$9,300	2024	\$1,360	\$1,360	\$1,360	\$1,360	\$1,360	\$2,500
12/31/2024	\$5,900	2025	\$820	\$820	\$820	\$820	\$820	\$1,800
3/30/2025	\$5,900	2025	\$820	\$820	\$820	\$820	\$820	\$1,800
	\$110,800		\$16,080	\$16,080	\$16,080	\$16,080	\$16,080	\$30,400

FY-23
6,400

FY-24
5,320

FY-25
4,360

Budgeting assumes all cooperators would take part and fund the agreement equally.

- 5) Beginning with the installment in 2016, a nitrate meter was also deployed at this to provide continuous nitrate concentrations in the Platte River. This location has been useful because it is above the L.W.S. and M.U.D. wellfields. The nitrate meter operates similarly to data being collected downstream at the Platte River at Louisville, and the Elkhorn River at Waterloo. Together, these monitors help provide a better understanding of nutrient concentrations and loads in the Lower Platte River.
- 6) Parameters monitored at the Platte River near Leshara include: water temperature, specific conductance, turbidity, dissolved oxygen, and nitrate
 - i) Data for the site can be accessed at: https://waterdata.usgs.gov/ne/nwis/uv?site_no=06796500
- 7) These water quality gages are operated seasonally from April 1 to October 1 because of the risk for ice damage to the equipment.

For questions or additional information, contact Matt Moser, (402)328-4184 mmoser@usgs.gov



For questions or additional information, contact Matt Moser, (402)328-4184 mmoser@usgs.gov

12/27/2021

Projects being worked on:

Field Climate/Metos:

Gained access to admin site for Metos. Should help in detecting problems on field equipment

Helping other water staff with firmware updates/Teraterm checks out in the field

More sites are up and running, Russ has been great at getting out and checking them

Hope to meet with water staff in person to go over some Metos questions next week.

Phase Area/Schuyler Training in Phoenix:

Finished meeting with producers and completing reports in Schuyler/Bellwood Phase Areas.

Entering phase data and approving as it comes in.

Getting 2021 phase report data in excel, start making this year's graphs and charts.

Nitrogen Certification:

Attended Nitrogen Certification workshop meeting

General Database Work:

Cleaning up tasks/workflow dashboard as things get done. Start working with new reports coming in for this reporting year.

Cleaning up People database

Work with producer side on phase reports/entry questions

Checking flow meter reports as they come in

Finding and fixing mistakes in the database