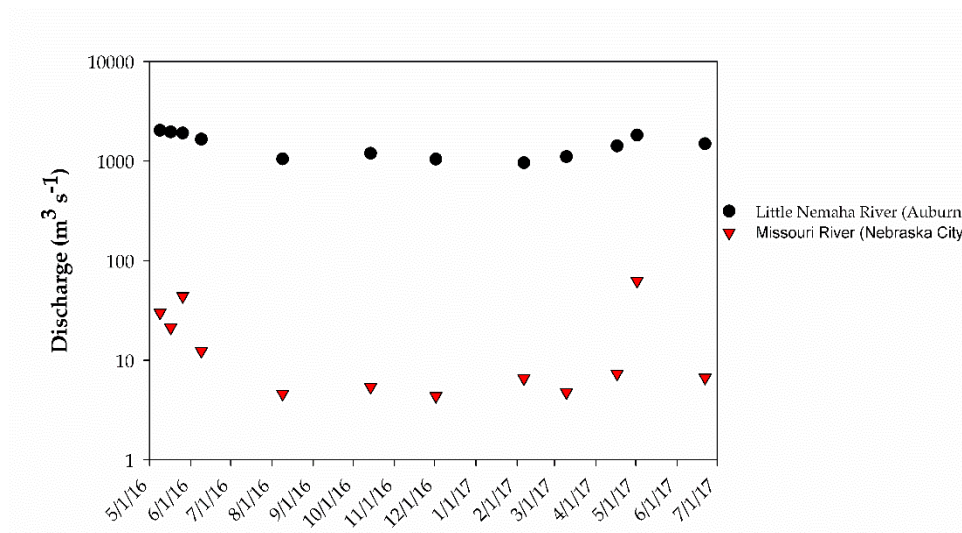
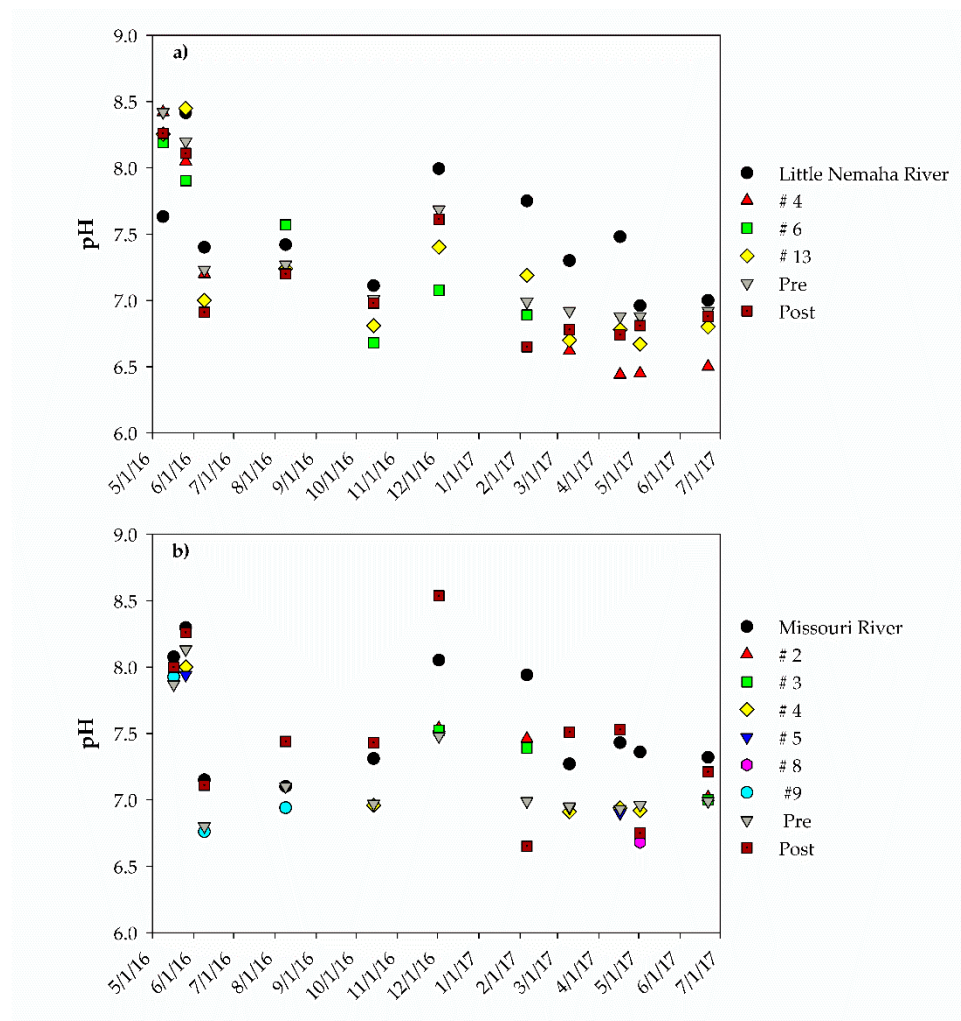


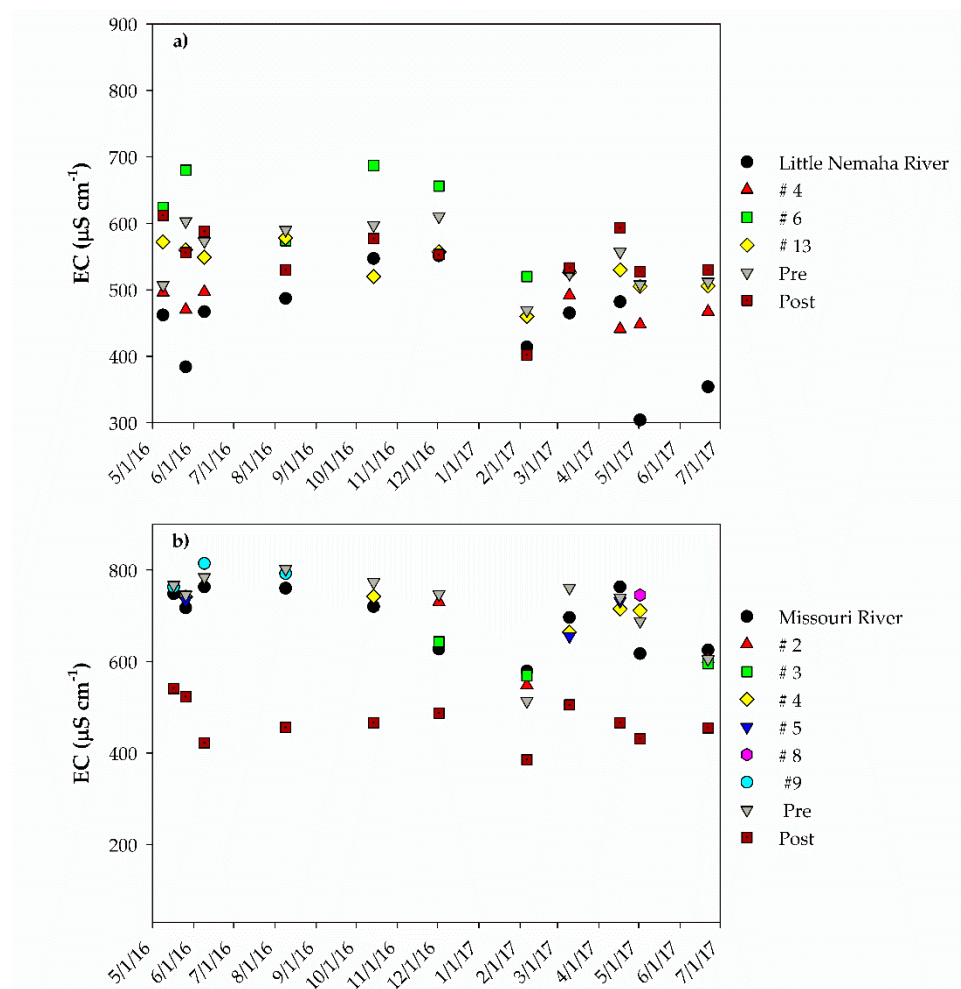
**Figure S1.** RBF wells' sites: Auburn (left) and Nebraska City (right).



**Figure S2.** Discharge from the Little Nemaha River (Auburn) and Missouri River (Nebraska City). Source: <https://waterdata.usgs.gov/nwis>

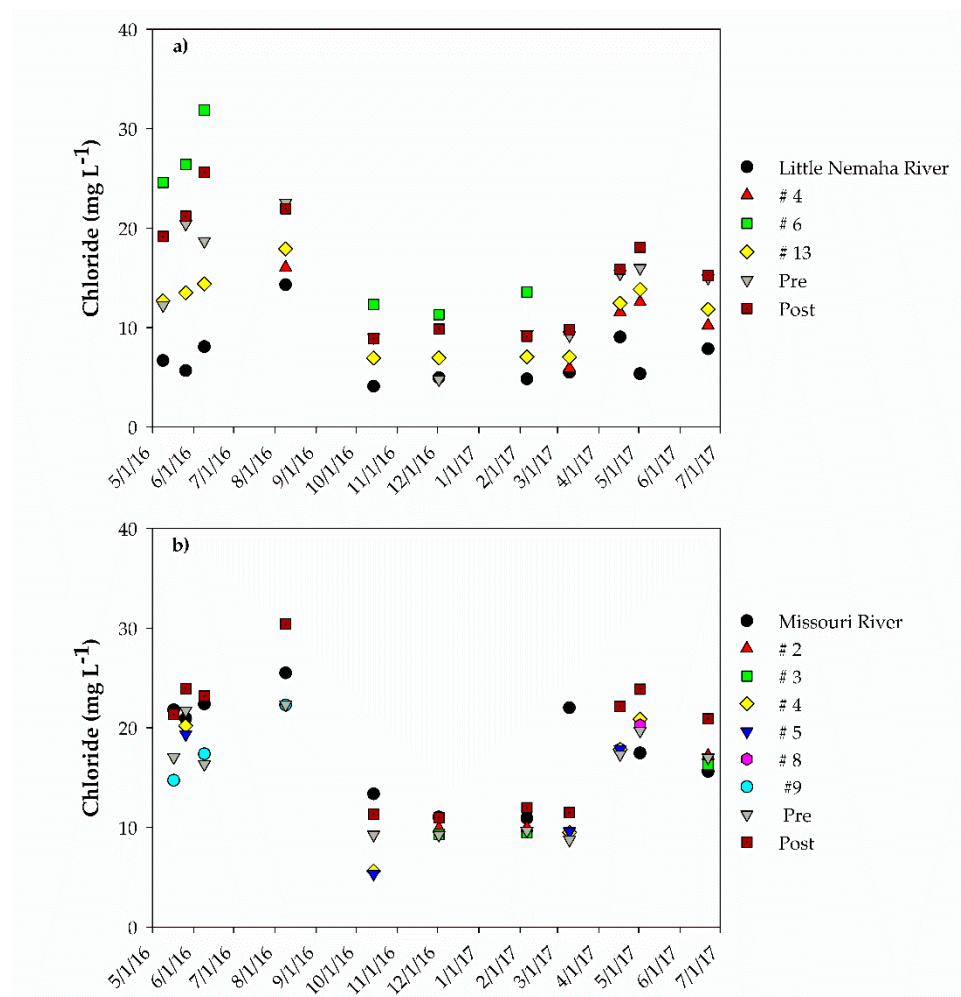


**Figure S3.** pH in a) Auburn and b) Nebraska City. LNR: Little Nemaha River; MR: Missouri River; Pre: Inflow water to the water treatment plants prior to any additional treatment; Post: water collected at the two water treatment plants after chlorination.

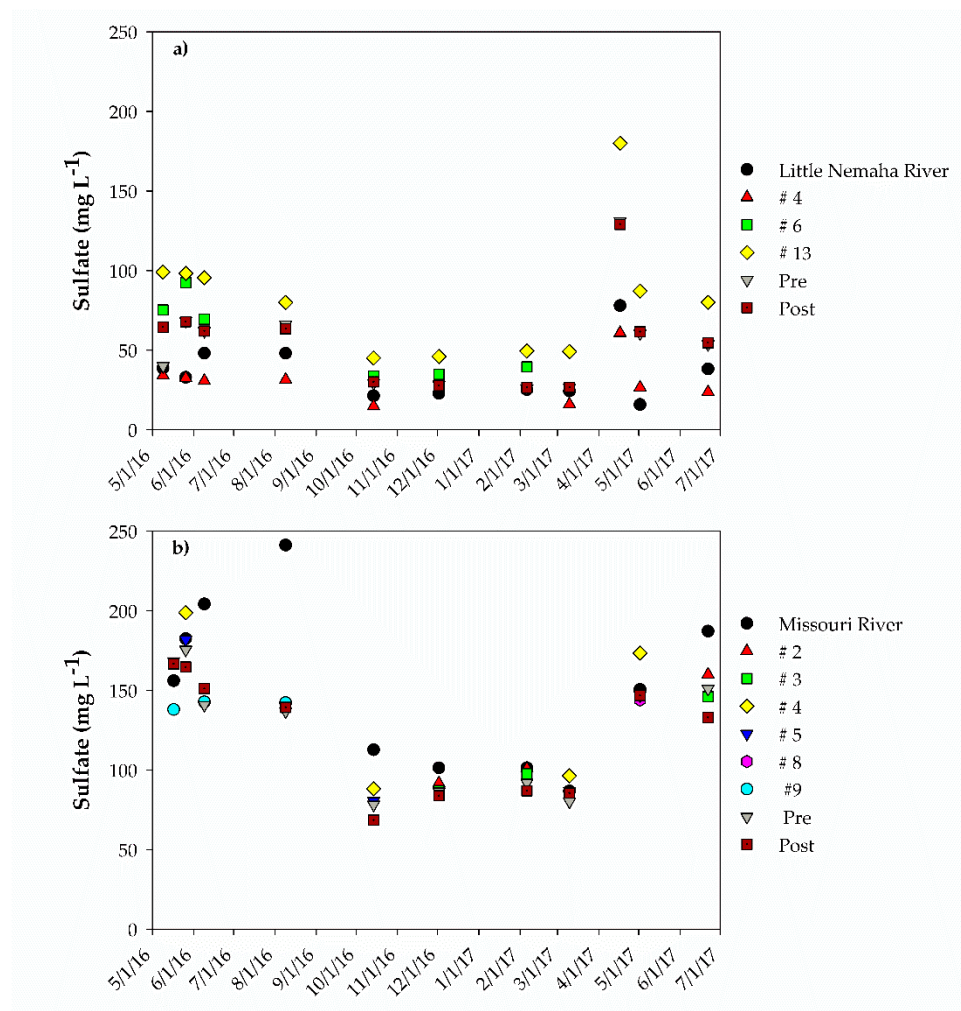


**Figure S4.** Electrical conductivity (EC) in a) Auburn and b) Nebraska City. LNR: Little Nemaha River; MR: Missouri River; Pre: Inflow water to the water treatment plants prior to any additional treatment; Post: water collected at the two water treatment plants after chlorination.

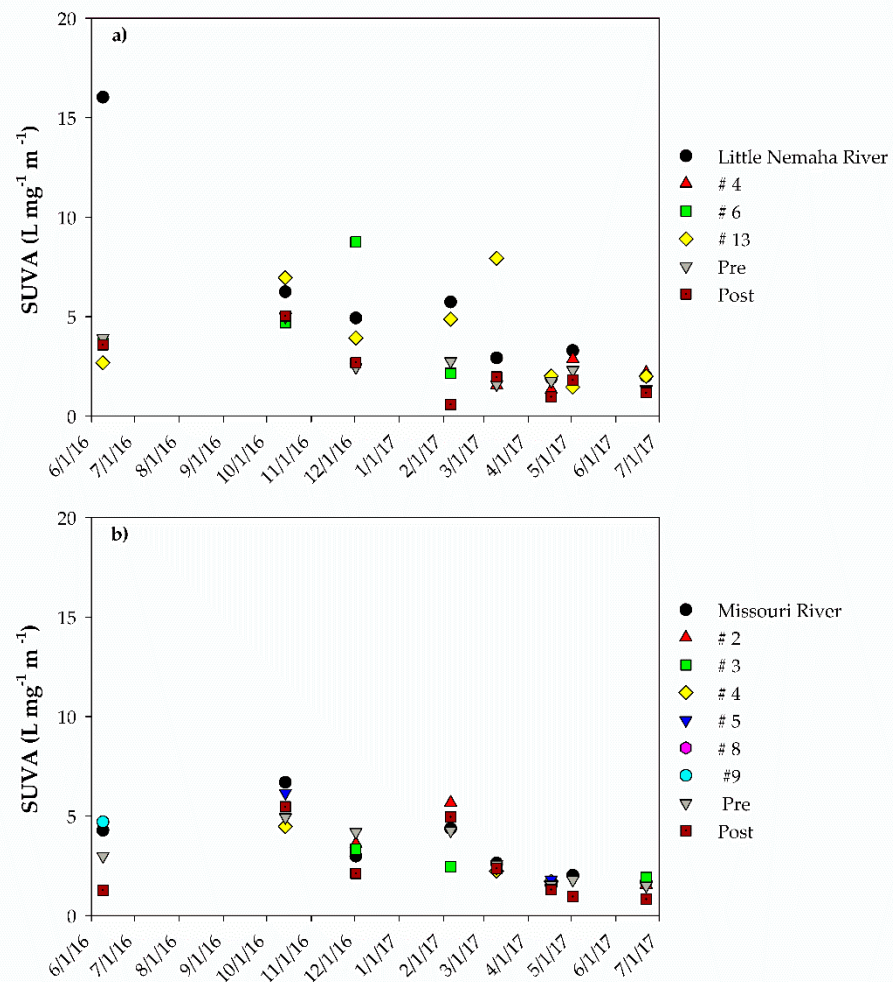




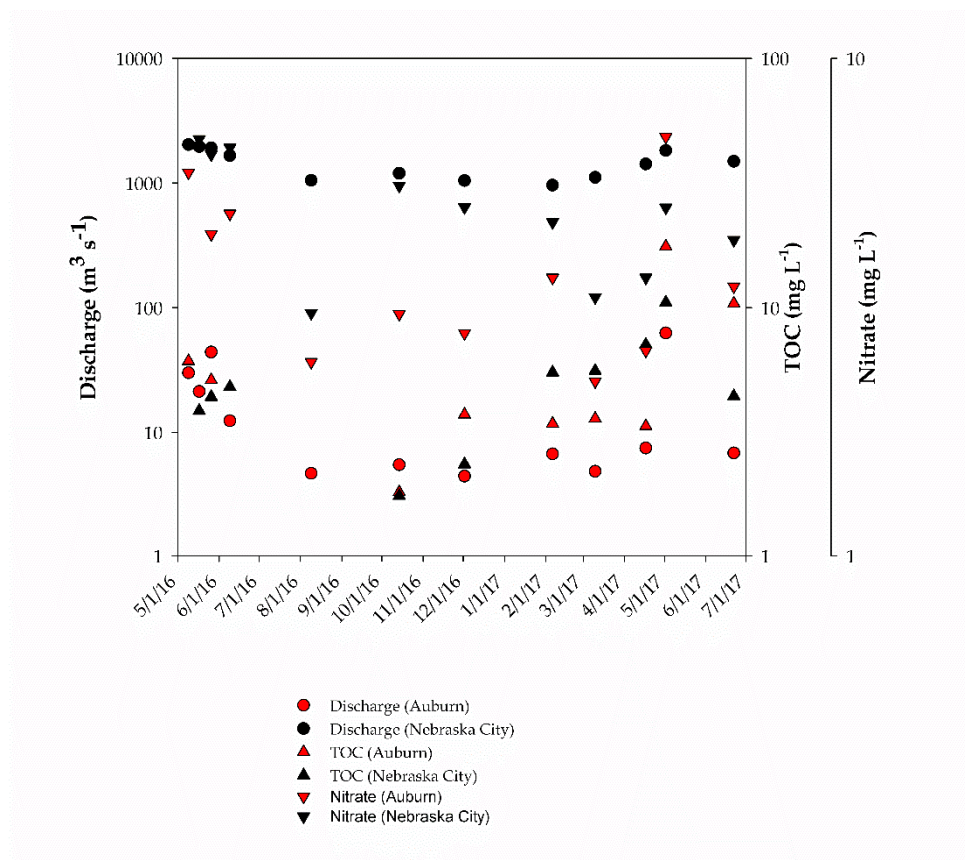
**Figure S5.** Chloride in a) Auburn and b) Nebraska City. LNR: Little Nemaha River; MR: Missouri River; Pre: Inflow water to the water treatment plants prior to any additional treatment; Post: water collected at the two water treatment plants after chlorination.



**Figure S6.** Sulfate in a) Auburn and b) Nebraska City. LNR: Little Nemaha River; MR: Missouri River; Pre: Inflow water to the water treatment plants prior to any additional treatment; Post: water collected at the two water treatment plants after chlorination.



**Figure S7.** Specific UV-absorbance (SUVA) in a) Auburn and b) Nebraska City. LNR: Little Nemaha River; MR: Missouri River; Pre: Inflow water to the water treatment plants prior to any additional treatment; Post: water collected at the two water treatment plants after chlorination.



**Figure S8.** Discharge, total organic carbon (TOC) and nitrate at the two sampling locations along the Little Nemaha River (Auburn) and Missouri River (Nebraska City).



**Table S1.** Characteristics of wells at the two RBF sites.

Well ID	Outside Diameter (m)	Depth (m)	Screen (m)	Static Water Level (m)	Construction
Auburn					
1	0.61	18.75	4.58	3.51	1981
2	0.61	17.68	4.58	3.35	1981
3	0.61	17.68	4.58	3.66	1981
4	0.61	15.55	4.72	3.20	1981
5	0.61	14.17	4.72	3.51	1981
6	0.61	15.70	4.58	4.27	1981
13	0.91	14.63	4.58	5.18	2004
19	0.61	13.41	4.58	3.96	1946
20	0.46	13.87	4.58	3.66	1966
Nebraska City					
1	0.64	25.30	8.53	2.36	1956
2	0.64	29.26	8.53	2.34	1956
3	0.64	25.60	8.53	2.59	1956
4	0.64	25.60	10.97	4.57	1964
5	0.64	25.60	10.97	2.59	1969
6	0.41	27.74	9.14	2.57	1981
7	0.41	25.60	12.19	3.79	1981
8	0.61	27.13	9.14	6.50	2001
9	0.61	28.65	13.41	6.78	2001
10	0.46	25.60	9.75	2.44	2010
11	0.46	25.60	9.75	3.05	2010

**Table S2.** Auburn – Geological formations at the riverbank filtration site.

Well #1	Well #2	Well #3	Well #4	Well #5	Well #6	Well #13	Well #19
0-1.5 m* Top soil	0-1.5 m Top soil	0-1.5 m Top soil	0-1.5 m Top soil	0-1.5 m Top soil	0-1.5 m Top soil	0-0.9 m Top soil	0-1.2 m Top soil
1.5-6.1 m Brown and very sticky clay	1.5-5.5 m Brown clay	1.5-6.1 m Brown clay	1.5-3.0 m Brown clay	1.5-6.1 m Gray clay	1.5-6.4 m Gray clay	0.9-7.3 m Gray clay	1.2-3.4 m Gray clay
6.1-7.6 m Fine buff sand	5.5-12.2 m Coarse sand and some fine sand	6.1-10.1 m Gray clay	3.0-7.9 m Gray clay	6.1-7.6 m Fine sand	6.4-8.5 m Coarse sand and some fine sand	7.3-10.4 m Fine and medium sand	3.4-6.4 m Brown clay
7.6-10.7 m Coarse sand and some fine sand	12.2-14.5 m Coarse sand and some boulders	10.1-10.7 m Sandy clay and boulders and coarse sand	7.9-12.2 m Fine sand and some coarse	7.6-10.4 m Fine sand	8.5-11.6 m Coarse sand and gravel, blue color	10.4-14.6 m Medium and coarse sand	6.4-10.1 m Gravel, coarse and fine sand
10.7-15.8 m Coarse sand and gravel		10.7-13.1 m Coarse sand	12.2-12.8 m Gray clay	10.4-12.2 m Coarse sand and trace of boulders	11.6-13.1 m Coarse sand and gravel, blue color		10.1-10.2 m Clay
15.8 m Blue shale		13.1-13.7 m Blue clay	12.8-14.0 m Coarse sand and small gravel	12.2 m Red shale	13.1 m Blue and red shale		10.2-13.7 m Gravel, coarse and fine sand
		13.7-16.5 m Coarse sand and trace of boulders	14.0 m Fine sand				13.7 m Blue shale
		16.5 m Red shale					
* Throughout this table m refers to “m below ground level (m bgl)”.							

**Table S3.** Nebraska City – Geological formations at the riverbank filtration site.

Well #1	Well #2	Well #3	Well #4	Well #5	Well #6	Well #7	Well #8	Well #9	Well #10	Well #11
0-1.8 m Brown sandy soil	0-1.8 m Black sandy soil	0-1.8 m Black sandy soil	0-1.8 m Black sandy clay	0-0.6 m Sandy top soil	0-2.4 m Fine silty sand	0-3.0 m Sandy soil	0-2.1 m Clay	0-1.5 m Top soil	0-3.4 m Clay	0-3.4 m Sandy clay
1.8-4.9 m Fine sand and clay	1.8-3.0 m Sandy blue clays and silt	1.8-3.4 m Fine silty sand	1.8-2.4 m Blue clay	0.6-2.4 m Sandy clay	2.4-3.4 m Blue silty clay	3.0-4.3 m Blue clay	2.1-4.3 m Silty gray clay	1.5-11.6 m Silty sand	3.4-6.1 m Fine sand	3.4-7.6 m Fine sand
4.9-6.4 m Blue silty clay and fine sand	3.0-4.9 m Fine and coarse sand, silty	3.4-4.9 m Fine sand	2.4-4.6 m Fine sand and sandy clay streaks	2.4-2.7 m Sandy blue clay	3.4-7.6 m Fine and coarse sand	4.3-12.2 m Fine and coarse sand	4.3-8.2 m Fine sand	11.6-15.2 m Fine medium sand	6.1-19.8 m Sand with gravel	7.6-25.3 m Sand with gravel
6.4-10.1 m Fine and coarse sand	4.9-6.4 m Fine and coarse sand and gravel	4.9-6.4 m Coarse and fine sand, trace of gravel	4.6-4.9 m Streak of blue clay	2.7-5.5 m Fine sand	7.6-18.3 m Fine and medium sand	12.2-15.2 m Fine and medium sand	8.2-18.3 m Medium to coarse sand	15.2-18.0 m Fine sand	19.8-15.6 m Cobbles	25.3-25.6 m Shale
10.1-12.2 m Fine sand	6.4-9.1 m Coarse sand and gravel	6.4-11.0 m Coarse and fine sand and gravel	4.9-6.7 m Coarse and fine sand	5.5-10.1 m Fine sand, coarse sand, some small gravel	18.3-22.9 m Fine and coarse gravel	15.2-18.3 m Fine and coarse sand	18.3-22.9 m Medium to coarse sand and some fine	18.0-25.0 m Medium coarse sand		
12.2-17.7 m Fine and coarse sand, gravel, clay balls and streaks of fine sand	9.1-11.0 m Fine and coarse sand, trace of gravel	11.0-12.8 m Fine and coarse sand	6.7-9.8 m Coarse to fine sand and gravel	10.1-10.4 m Fine sand	22.9 m Limestone	18.3-22.3 m Coarse sand and gravel	22.9-24.4 m Coarse gravel	25.0-25.3 m Clay		
17.7-18.9 m Blue clay with fine	11.0-11.3 m Fine sand	12.8-13.7 m Fine sand	9.8-12.8 m Fine sand	10.4-15.2 m Coarse and fine sand		22.3 m Blue shale		25.3-28.7 m		

and coarse sand				and small gravel				Sand and coarse gravel		
<i>continued</i>										
Well #1	Well #2	Well #3	Well #4	Well #5	Well #6	Well #7	Well #8	Well #9	Well #10	Well #11
18.9-22.4 m Fine and coarse sand and gravel, pieces of limestone and shale	11.3-14.0 m Coarse sand, trace of gravel	13.7-14.6 m Fine sand, limestone chips, few large rocks and blue clay	12.8-15.2 m Coarse and fine sand and gravel	15.2-16.5 m Sand and gravel						
22.4 m Black shale	14.0-17.7 m Fine and coarse sand, trace of gravel	14.6-15.2 m Coarse and fine sand and gravel	15.2-17.4 m Gravel, coarse and fine sand, clay balls	16.5-17.1 m Fine sand						
	17.7-19.5 m Fine sand	15.2-17.1 m Fine sand, clay and trace of coarse sand	17.4-18.9 m Coarse and fine sand	17.1-19.5 m Fine to medium coarse sand						
	19.5-20.1 m Fine and coarse sand, trace of gravel, streaks of clay	17.1-18.6 m Coarse sand and gravel	18.9-20.4 m Coarse and fine sand, trace of gravel	19.5-21.3 m Coarse sand and gravel						
	20.1-21.6 m Fine and coarse sand, trace of gravel	18.6-21.9 m Gravel and coarse sand	20.4-22.3 m Gravel, coarse sand, boulders and clay	21.3 m Limestone						
	21.6-23.5 m	21.9-22.6 m	22.3 m							

	Coarse sand, gravel, trace of fine sand and clay balls	Gravel and coarse sand, clay balls and trace of fine sand	Limestone							
<i>continued</i>										
Well #1	Well #2	Well #3	Well #4	Well #5	Well #6	Well #7	Well #8	Well #9	Well #10	Well #11
	23.5-24.4 m Blue clay, very hard	22.6-23.2 m Coarse and fine sand, coarse gravel and limestone chips								
	24.4-25.9 m Fine and coarse sand and gravel	23.3-25.6 m Coarse and fine sand, some gravel								
	25.9-26.5 m Fine and coarse sand, gravel, lime rock and small boulders	26.5 m Limestone								
	26.5 m Black shale									
* Throughout this table m refers to “m below ground level (m bgl)”.										



**Table S4.** Method detection limits.

Analyte	Method detection limit (MDL)
<i>Ion chromatograph</i>	
Bromide	0.0239 mg L <sup>-1</sup>
Chloride	0.0238 mg L <sup>-1</sup>
Fluoride	0.0096 mg L <sup>-1</sup>
Nitrate	0.0059 mg L <sup>-1</sup>
Nitrite	0.0047 mg L <sup>-1</sup>
Orthophosphate	0.0517 mg L <sup>-1</sup>
Sulfate	0.0606 mg L <sup>-1</sup>
<i>Total organic carbon analyzer</i>	
Total organic carbon	0.16 mg L <sup>-1</sup>
Dissolved organic carbon	0.16 mg L <sup>-1</sup>

**Table S5.** Basic water quality properties (pH, electrical conductivity, EC, total organic carbon, TOC, dissolved organic carbon, DOC) at the two RBF sites and water utilities.

River Well ID	pH				EC ( $\mu\text{S}$ )				TOC ( $\text{mg L}^{-1}$ )				DOC ( $\text{mg L}^{-1}$ )			
	Min	Max	Avg	Stdev	Min	Max	Avg	Stdev	Min	Max	Avg	Stdev	Min	Max	Avg	Stdev
<i>Auburn</i>																
Little Nemaha River	6.96	8.41	7.50	0.44	304.00	551.00	447.00	76.65	1.80	17.60	5.99	4.69	1.58	7.15	3.57	1.82
4	6.44	8.42	7.10	0.83	441.00	497.00	473.00	22.95	0.63	2.70	1.19	1.01	0.70	2.09	1.12	0.65
6	6.68	8.19	7.39	0.60	520.00	687.00	623.50	65.49	0.57	1.01	0.79	0.15	0.27	1.17	0.69	0.40
13	6.67	8.45	7.21	0.61	460.00	578.00	533.00	34.89	0.32	1.40	0.72	0.34	0.23	1.09	0.68	0.26
Pre	6.88	8.42	7.31	0.55	469.00	610.00	550.00	48.05	0.32	0.78	0.56	0.17	0.33	1.28	0.76	0.28
Post	6.65	8.26	7.18	0.56	402.00	612.00	545.55	55.87	0.35	0.86	0.61	0.21	0.25	2.08	0.95	0.57
<i>Nebraska City</i>																
Missouri River	7.10	8.30	7.57	0.43	579.00	763.00	692.27	68.10	1.74	10.50	5.02	2.47	1.58	5.78	4.46	1.52
2	7.02	7.54	7.34	0.28	548.00	730.00	627.67	93.09	1.19	2.97	2.05	0.89	1.97	3.19	2.44	0.66
3	7.00	7.52	7.30	0.27	569.00	643.00	602.33	37.54	1.69	3.35	2.58	0.84	1.88	4.56	3.23	1.34
4	6.91	8.00	7.15	0.48	664.00	742.00	714.60	31.71	1.22	2.22	1.89	0.46	1.34	3.31	2.55	0.85
5	6.90	7.94	7.19	0.50	655.00	774.00	723.50	49.68	1.45	2.52	1.81	0.48	1.29	3.27	2.52	1.07
8	6.68	6.68	6.68	n.a.	745.00	745.00	745.00	n.a.	2.96	2.96	2.96	n.a.	3.00	3.00	3.00	n.a.
9	6.76	7.93	7.21	0.63	763.00	814.00	789.67	25.58	2.25	2.92	2.62	0.34	2.40	2.40	2.40	n.a.
10	6.80	6.80	6.80	n.a.	856.00	856.00	856.00	n.a.	2.64	2.64	2.64	n.a.	2.23	2.23	2.23	n.a.
11	6.91	7.78	7.35	0.62	753.00	812.00	782.50	41.72	2.17	2.17	2.17	n.a.	-	-	-	n.a.
Pre	6.80	8.13	7.20	0.44	513.00	802.00	720.45	87.40	1.35	3.38	2.19	0.78	1.35	3.76	2.61	0.76
Post	6.65	8.54	7.49	0.59	385.00	541.00	467.00	45.57	1.19	2.00	1.55	0.27	0.61	2.25	1.50	0.61

n.a. Not Applicable, not enough data to estimate the standard deviation. “-” data not available. Pre: Inflow water to the water treatment plants prior to any additional treatment; Post: water collected at the two water treatment plants after chlorination.

**Table S6.** Removal (%) of dissolved organic carbon (DOC) at the two water treatment facilities.

Well ID	06/09/16	08/09/16	10/14/16	12/2/16	2/6/17	3/10/17	4/17/17	5/2/17	6/22/17
Auburn									
4	-	-	-	-	-	71	53	90	83
6	74	-	70	85	54	-	-	-	-
13	78	-	85	76	76	76	75	89	82
Pre <sup>a</sup>	83	-	79	63	74	72	79	90	73
Nebraska City									
2	-	-	-	27	63			-	40
3	-	-	-	30	21			-	39
4	-	-	15	-	-	42	43	-	-
5	-	-	18	-	-	35	43	-	-
8	-	-	-	-	-	-	-	42	-
9	52	-	-	-	-	-	-	40	-
10	56	-	-	-	-	-	-	-	-
11	-	-	-	-	-	-	-	-	-
Pre <sup>a</sup>	55	-	14	24	51	47	35	44	36

<sup>a</sup> Pre: Inflow water to the water treatment plant prior to any additional treatment. -: not available since the two towns run only two to three wells simultaneously. In Auburn, well 4 is not being used due to the high levels of nitrate.

**Table S7.** Trihalomethanes at the two water treatment plants.

Analyte	Auburn*				Nebraska City*			
	Min ( $\mu\text{g L}^{-1}$ )	Max ( $\mu\text{g L}^{-1}$ )	Avg ( $\mu\text{g L}^{-1}$ )	Stdev	Min ( $\mu\text{g L}^{-1}$ )	Max ( $\mu\text{g L}^{-1}$ )	Avg ( $\mu\text{g L}^{-1}$ )	Stdev
Bromoform	1.31	11.27	4.22	2.89	0.37	11.44	3.06	3.03
Chloroform	1.16	4.03	2.84	0.87	15.62	53.82	26.97	12.92
Dichlorobromomethane	3.24	14.97	5.67	3.42	3.85	27.88	16.22	8.58
Dibromochloromethane	3.24	12.92	7.32	3.11	4.50	18.67	11.24	4.59
Total THMs	11.17	30.47	20.05	6.63	28.88	98.54	57.48	25.62

\*Water samples were collected at the two water treatment plants after chlorination.