Lamoine Consolidated School GET WET! Results

Since 2006, the Lamoine Conservation Commission (LCC) has carried out the GET WET! (Groundwater Education Through Water Evaluation & Testing) program in the Lamoine Consolidated School in partnership with the University of Maine's Mitchell Center for Environmental and Water Research. Under the program, fifth and sixth grade students test home water samples, learning practical science skills and collecting valuable longitudinal and geographic data on the town's water quality. In 2016, the Mitchell Center ended support of the program. The LCC has continued the program independently, and will continue to do in the future. This document summarizes the results of the testing to date.

The National Primary Drinking Water Regulations (NPDWR) are legally enforceable primary standards and treatment techniques that apply to public water systems. Primary standards and treatment techniques protect public health by limiting the levels of contaminants in drinking water. However, EPA does not regulate private wells nor does it provide recommended criteria or standards for individual wells. EPA offers information regarding the importance of testing private wells and guidance on technologies that may be used to treat or remove any contaminants. The results from the GET WET! program are compared to applicable drinking water standards. Here are some concepts relevant to understanding the data:

> Maximum Contaminant Level (MCL) - The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
>
> Maximum Contaminant Level Goal (MCLG) - The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
>
> EPA has also established National Secondary Drinking Water Regulations (NSDWRs) that set non-mandatory water quality standards for 15 contaminants. EPA does not enforce these Secondary Maximum Contaminant Levels (SMCLs). They are established as guidelines to assist public water systems in managing their drinking water for aesthetic considerations, such as taste, color, and odor. These contaminants are not considered to present a risk to human health at the SMCL.
>
> SMCLs exist for pH, chloride, and total iron. An MCL exists for nitrate. There are no standards for hardness and conductivity. These standards are discussed below for each parameter.

Results from the GET WET! Program suggest that the water quality in Lamoine is good.

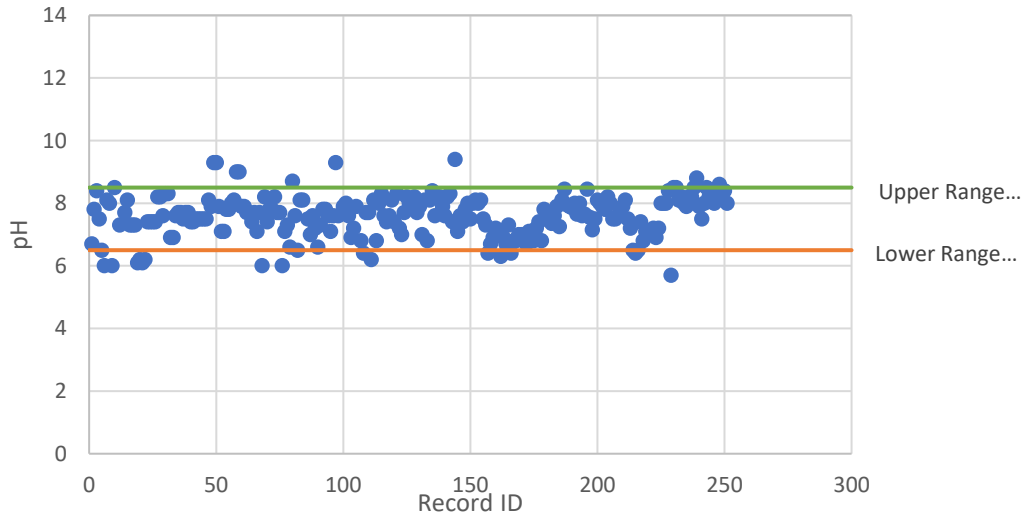
pH

The pH test measures the concentration of hydrogen ions in a solution and that concentration of hydrogen determines if a solution is acidic or basic. A change of 1 pH unit is a 10-fold change in acid level. The pH of pure water is 7. Water with a pH lower than 7 is considered acidic, and with a pH greater than 7 is considered basic. The SMCL range for pH is 6.5 to 8.5. Noticeable effects for pH below 6.5 may include a bitter aftertaste or corrosion. If the pH is above 8.5, the water may cause deposits.

Table 1: pH Descriptive Statistics

Year	N	Mean	Median	Std Dev	Min	Max
2006	13	7.4	7.5	0.87	6	8.5
2007	62	7.6	7.7	0.70	6	9.3
2008	28	7.5	7.5	0.65	6.4	9.3
2009	23	7.7	7.7	0.53	6.2	8.3
2010	24	7.9	8.0	0.51	6.8	9.4
2011	23	6.9	6.9	0.29	6.3	7.4
2012	20	7.8	7.8	0.34	7.2	8.5
2013	15	7.8	7.8	0.29	7.2	8.2
2014	5	6.7	6.5	0.41	6.4	7.4
2015	6	7.1	7.1	0.12	6.9	7.2
2017	27	8.1	8.2	0.55	5.7	8.8
2018	16	7.7	7.8	0.70	6.7	8.9
All Years	**262**	**7.6**	**7.65**	**0.65**	**5.7**	**9.4**

Figure 1: Lamoine Consolidated School pH Get Wet Results (2006-2018)



Chloride

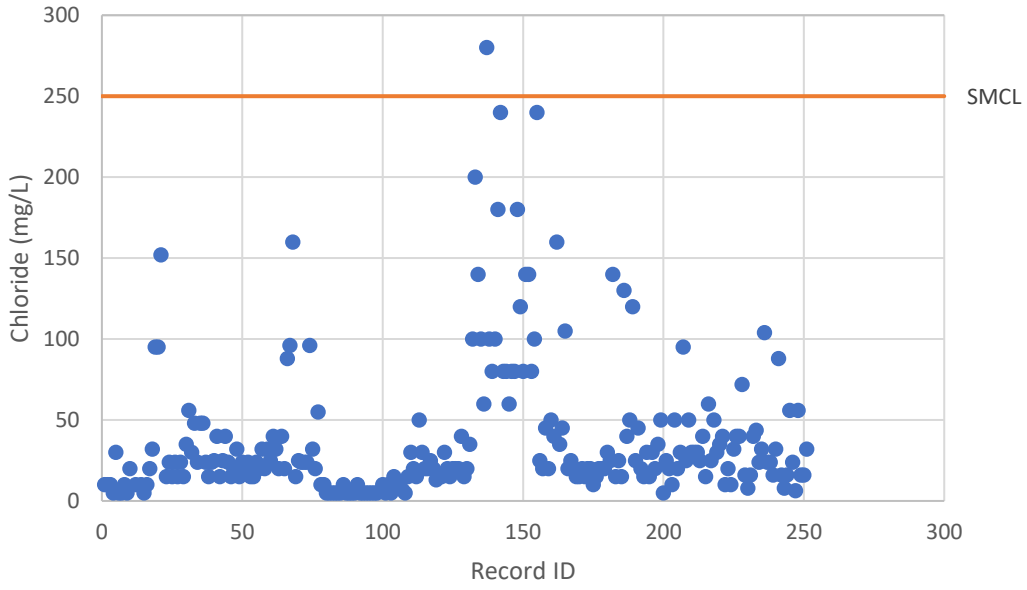
The EPA standard for chloride is also a SMCL. The presence of chloride at levels above the SMCL may result in a salty taste. The EPA SMCL for chloride is 250 mg/L (milligrams per liter). Chloride is naturally occurring in groundwater. Chloride presence in groundwater may also be attributable to salt water intrusion, swimming pools, septic systems, or possible infiltration of road salt.

Table 2: Chloride Descriptive Statistics

Year	N	Mean	Median	Std Dev	Min	Max
2006	13	10.4	10	7.21	5	30
2007	61	36.1	24	30.83	10	160
2008	29	6.6	5	2.69	5	15
2009	23	22.7	20	9.24	13	50
2010	24	126.7	100	62.04	60	280
2011	23	33.9	20	33.98	10	160
2012	20	42.3	27.5	39.22	15	140
2013	15	33.0	30	21.70	5	95
2014	5	38.0	40	18.23	15	60
2015	6	24.2	25	12.81	10	40
2017	27	33.3	24	24.19	6.4	104
2018[a]						
All Years	**246**	**38.4**	**24**	**43.44**	**5**	**280**

[a] No data for 2018 due to insensitive measurements

Figure 2: Lamoine Consolidated School Get Wet Chloride Results (2006-2017)



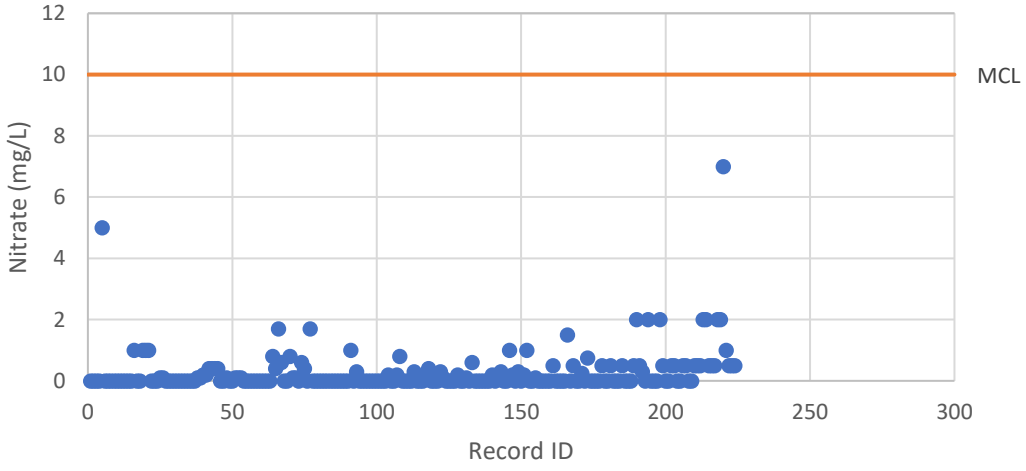
Nitrate

The EPA standard for nitrate is a Maximum Contaminant Level (MCL). As previously discussed, an MCL is a water quality standard for substances that can harm health. Exposure to nitrate at levels above the MCL primarily effects infants. The MCL for nitrate is 10 mg/L (milligrams per liter). Infants less than 6 months of age should not drink water (or formula made with water) that contains more than 10 mg/L of nitrate. This is because of concerns related to methemoglobinemia (also called blue-baby disease), a condition in infants which inhibits the blood's ability to carry oxygen. If not caught early and treated, this condition can be fatal. Possible nitrate sources include fertilizers, septic systems, livestock manure, and pet waste.

Table 3: Nitrate Descriptive Statistics

Year	N	Mean	Median	Std Dev	Min	Max
2006	15	0.33	0	1.29	0	5
2007	62	0.23	0	0.40	0	1.7
2008	31	0.08	0	0.23	0	1
2009	23	0.07	0	0.12	0	0.4
2010	24	0.17	0	0.30	0	1
2011	23	0.17	0	0.36	0	1.5
2012	20	0.42	0	0.71	0	2
2013	15	0.40	0.5	0.51	0	2
2014	5	1.10	0.5	0.82	0.5	2
2015	6	1.92	0.75	2.56	0.5	7
2017						
2018						
All Years	**224**	**0.28**	**0**	**0.71**	**0**	**7**

Figure 3: Lamoine Consolidated School Get Wet Nitrate Results (2006-2015)



Hardness

Hardness in drinking water is defined as those minerals that dissolve in water having a positive electrical charge. The primary components of hardness are calcium (Ca^{++}) and magnesium (Mg^{++}) ions.

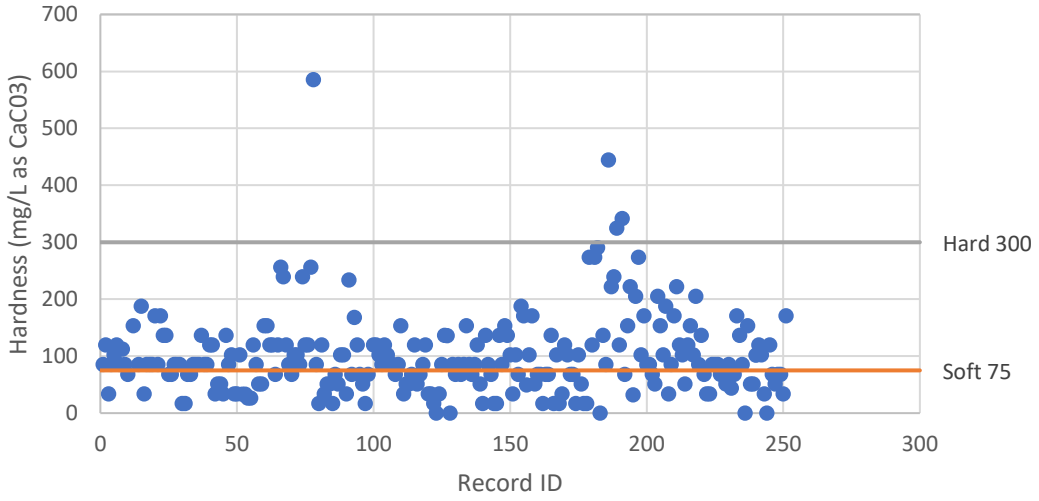
Hardness is considered an aesthetic water quality factor. Hard water may produce soap scum, leave white mineral deposits on dishes, or reduce the efficiency of devices that heat water. There are no health concerns related to hardness.

Soft water is defined as a value <75 mg/L and hard water as >300 mg/L.

Table 4: Hardness Descriptive Statistics

Year	N	Mean	Median	Std Dev	Min	Max
2006	13	102.1	85.5	38.66	34.2	188.1
2007	62	96.5	85.5	55.20	17.1	256.5
2008	29	100.7	68.4	104.32	17.1	585.5
2009	23	69.9	68.4	43.05	0	153.9
2010	24	93.3	85.5	48.62	17.1	188.1
2011	23	66.8	68.4	42.83	17.1	171
2012	20	196.6	213.8	114.59	0	444.6
2013	15	123.1	102.6	58.26	34.2	222.3
2014	5	126.5	119.7	57.48	51.3	205.2
2015	6	74.1	77.0	38.49	34.2	136.8
2017	27	79.5	68.4	44.67	0	171
2018	16	151.0	102.6	232.48	0	1000
All Years	**263**	**102.8**	**85.5**	**90.07**	**0**	**1000**

Figure 4: Lamoine Consolidated School Get Wet Hardness Results (2006-2018)



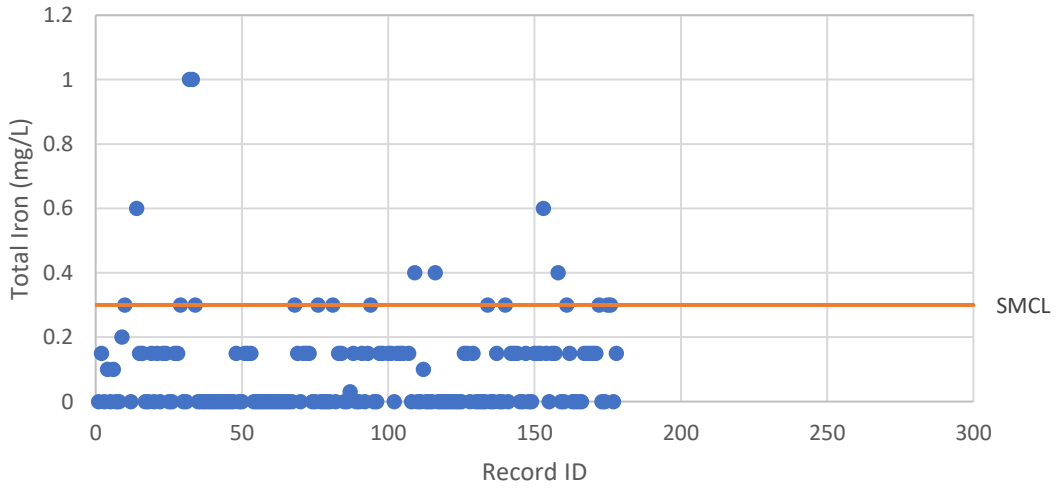
Total Iron

The EPA standard for Total Iron is a SMCL. The EPA SMCL for Total Iron is 0.3 mg/L (milligrams per liter). Iron is a naturally occurring substance in soils and rocks and may leach into groundwater. Pipes may also be a source of iron in drinking water. Possible aesthetic effects from concentrations above 0.3 mg/l include rusty color to the water, presence of sediment, metallic taste, or reddish or orange staining on laundry.

Table 5: Total Iron Descriptive Statistics

Year	N	Mean	Median	Std Dev	Min	Max
2006	13	0.12	0.00	0.17	0	0.6
2007	62	0.09	0.00	0.19	0	1
2008	29	0.09	0.03	0.09	0	0.3
2009	23	0.06	0.00	0.12	0	0.4
2010	24	0.11	0.08	0.14	0	0.6
2011	23	0.13	0.15	0.13	0	0.4
2012						
2013						
2014						
2015						
2017						
2018	16	0.28	0.15	0.46	0.15	2
All Years	**190**	**0.11**	**0**	**0.20**	**0**	**2**

Figure 5: Lamoine Consolidated School Get Wet Total Iron Result (2006-2011, 2018)



Conductivity

Conductivity is a measure of the ability of water to pass an electrical current. Conductivity in water is affected by the presence of inorganic dissolved solids such as chloride, nitrate, sulfate, and phosphate anions (ions that carry a negative charge) or sodium, magnesium, calcium, iron, and aluminum cations (ions that carry a positive charge). A normal conductivity value is roughly twice the total hardness in unsoftened water samples. If conductivity is much greater than two times the hardness, it may indicate the presence of other ions such as chloride, nitrate, or sulfate, which may be human-influenced or naturally occurring. There is no standard for conductivity.

Table 6: Conductivity Descriptive Statistics

Year	N	Mean	Median	Std Dev	Min	Max
2006	13	228	206	100.25	48	427
2007	62	253	225	126.46	4.1	633
2008	28	228	199	95.56	61	452.5
2009	23	158	152	111.54	2	479
2010	24	236	203	156.24	63	784
2011	23	278	243	228.15	65	1080
2012	20	349	266	262.41	70	1200
2013	15	273	221	197.06	68	871
2014	5	188	79	204.10	23.4	482
2015	6	244	232	122.78	122	456
2017	27	206	190	94.05	58	521
2018	16	161	155	107.99	1.92	483
All Years	**262**	**238**	**205**	**156.91**	**1.92**	**1200**

Figure 6: Lamoine Consolidated School Get Wet Conductivity Results (2006-2018)

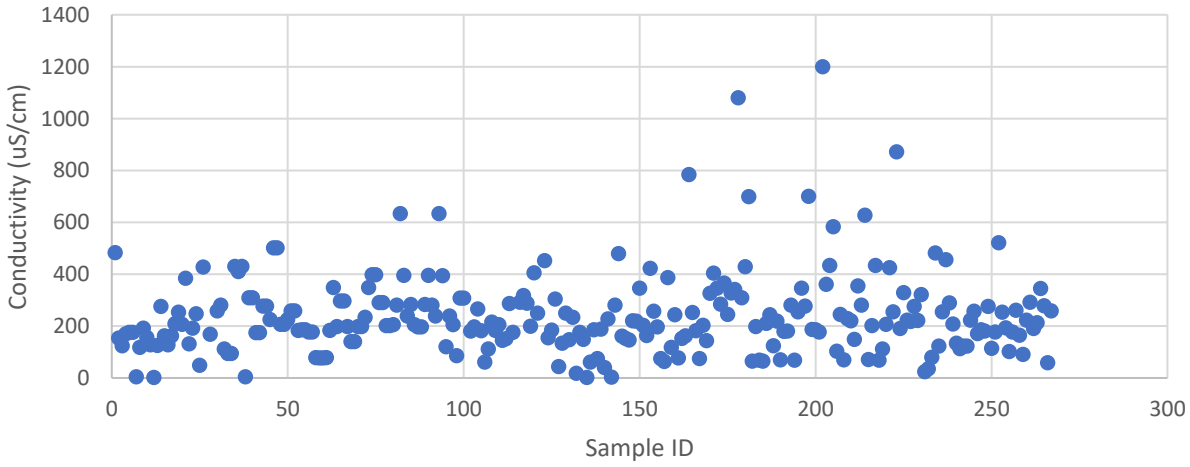


Figure 7: Mean Data by Year

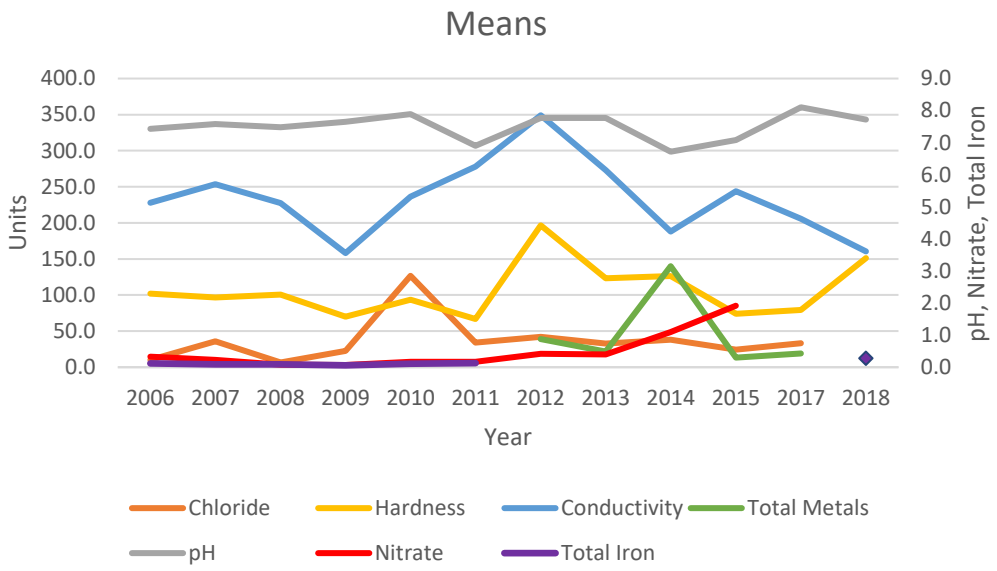


Table 7: All Get Wet Data. Values in red indicate values above the applicable water quality standard.

Sample ID	Year	Chloride	Nitrate	pH	Hardness	Total Iron	Conductivity
1	2006	10	0	6.7	85.5	0	162
2	2006	10	0	7.8	119.7	0.15	209
3	2006	10	0	8.4	34.2	0	253
4	2006	5	0	7.5	85.5	0.1	206
5	2006	30	5	6.5	102.6	0	384
6	2006	5	0	6	119.7	0.1	131
7	2006	5	0	8.1	85.5	0	191
8	2006	10	0	8	112.6	0	247
9	2006	5	0	6	85.5	0.2	48
10	2006	20	0	8.5	68.4	0.3	427
11	2006		0				
12	2006	10	0	7.3	153.9	0	168
13	2006		0				
14	2006	10	0	7.7	85.5	0.6	258
15	2006	5	0	8.1	188.1	0.15	281
16	2007	10	1	7.3	34.2	0.15	111
17	2007	20	0	7.3	85.5	0	94
18	2007	32	0	7.3	85.5	0	94
19	2007	95	1	6.1	85.5	0.15	430
20	2007	95	1	6.2	171	0	410
21	2007	152	1	6.1	85.5	0.15	430
22	2007		0	6.2	171	0	4.1

Sample ID	Year	Chloride	Nitrate	pH	Hardness	Total Iron	Conductivity
23	2007	15	0	7.4	136.8	0.15	309
24	2007	24	0	7.4	136.8	0.15	309
25	2007	15	0.1	7.4	68.4	0	174
26	2007	24	0.1	7.4	68.4	0	174
27	2007	15	0	8.2	85.5	0.15	277
28	2007	24	0	8.2	85.5	0.15	277
29	2007	15	0	7.6	85.5	0.3	225
30	2007	35	0	8.3	17.1	0	501
31	2007	56	0	8.3	17.1	0	501
32	2007	30	0	6.9	68.4	1	206
33	2007	48	0	6.9	68.4	1	206
34	2007	24	0	7.6	85.5	0.3	225
35	2007	48	0	7.7	85.5	0	258
36	2007	48	0	7.7	85.5	0	258
37	2007	24	0	7.5	136.8	0	183
38	2007	15	0.1	7.7	85.5	0	186
39	2007	24	0.1	7.7	85.5	0	186
40	2007	25	0.2	7.4	119.7	0	177
41	2007	40	0.2	7.4	119.7	0	177
42	2007	15	0.4	7.5	34.2	0	78
43	2007	25	0.4	7.5	51.3	0	77
44	2007	40	0.4	7.5	51.3	0	77
45	2007	24	0.4	7.5	34.2	0	78
46	2007	15	0	7.5	136.8	0	183
47	2007	20	0	8.1	85.5	0	348
48	2007	32	0.1	7.9	102.6	0.15	198
49	2007	15	0	9.3	34.2	0	297
50	2007	24	0	9.3	34.2	0	297
51	2007	20	0.1	7.9	102.6	0.15	198
52	2007	24	0.1	7.1	33.3	0.15	140
53	2007	15	0.1	7.1	33.3	0.15	140
54	2007	15	0	7.8	26.5	0	197.5
55	2007	24	0	7.8	26.5	0	197.5
56	2007	20	0	8	119.7	0	233
57	2007	32	0	8.1	85.5	0	348
58	2007	20	0	9	51.3	0	397
59	2007	32	0	9	51.3	0	397
60	2007	25	0	7.9	153.9	0	290
61	2007	40	0	7.9	153.9	0	290
62	2007	32	0	7.7	119.7	0	202
63	2007	20	0	7.7	119.7	0	202

Sample ID	Year	Chloride	Nitrate	pH	Hardness	Total Iron	Conductivity
64	2007	40	0.8	7.4	68.4	0	205
65	2007	20	0.4	7.7	119.7	0	280
66	2007	88	1.7	7.1	256.5	0	633
67	2007	96	0.6	7.7	239.4	0	395
68	2007	160	0	6	119.7	0.3	239
69	2007	15	0	8.2	85.5	0.15	283
70	2007	25	0.8	7.4	68.4	0	205
71	2007	24	0.1	7.8	102.6	0.15	197
72	2007	24	0.1	7.8	102.6	0.15	197
73	2007	24	0	8.2	85.5	0.15	283
74	2007	96	0.6	7.7	239.4	0	395
75	2007	32	0.4	7.7	119.7	0	280
76	2007	20	0	6	119.7	0.3	239
77	2007	55	1.7	7.1	256.5	0	633
78	2008	10	0	7.3	585.5	0	394
79	2008	10	0	6.6	85.5	0	119.5
80	2008	5	0	8.7	17.1	0	238
81	2008	5	0	7.6	119.7	0.3	205
82	2008	5	0	6.5	34.2	0	86
83	2008	5	0	8.1	51.3	0.15	307
84	2008	5	0	8.1	51.3	0.15	307
85	2008	5	0		17.1	0	
86	2008	10	0	7.5	68.4	0	181
87	2008	5	0	7	51.3	0.03	196
88	2008	5	0	7.6	102.6	0.15	266
89	2008	5	0	7.2	102.6	0	182
90	2008	5	0	6.6	34.2	0	61
91	2008	10	1	7.3	234.2	0.15	111
92	2008	5	0	7.8	68.4	0	215
93	2008	5	0.3	7.8	168.4	0.15	183.5
94	2008	5	0	7.6	119.7	0.3	205
95	2008	5	0	7.1	68.4	0	145
96	2008	5	0	7.6	51.3	0	151.5
97	2008	5	0	9.3	17.1	0.15	287
98	2008	5	0	7.6	68.4	0.15	176
99	2008		0				
100	2008	10	0	7.9	119.7	0.15	291
101	2008	5	0	8	119.7	0.15	317.5
102	2008	10	0	7.6	102.6	0	288
103	2008	5	0	6.9	85.5	0.15	198.5
104	2008	15	0.2	7.2	119.7	0.15	405

Sample ID	Year	Chloride	Nitrate	pH	Hardness	Total Iron	Conductivity
105	2008	10	0	7.9	102.6	0.15	249.5
106	2008		0				
107	2008	7	0.2	6.8	85.5	0.15	452.5
108	2008	5	0.8	6.4	68.4	0	155
109	2009	15	0	7.7	85.5	0.4	184
110	2009	30	0	7.7	153.9	0	304
111	2009	20	0	6.2	34.2	0	43
112	2009	15	0	8.1	51.3	0.1	134
113	2009	50	0.3	6.8	51.3	0	250
114	2009	30	0	8	68.4	0	147
115	2009	20	0	8.3	119.7	0	234
116	2009	20	0	7.6	51.3	0.4	18.3
117	2009	25	0.2	7.4	68.44	0	175
118	2009	20	0.4	7.6	85.5	0	148
119	2009	13	0	8.1	119.7	0	2
120	2009	15	0	7.4	34.2	0	61
121	2009	15	0	8.3	34.2	0	185
122	2009	30	0.3	7.2	17.1	0	74
123	2009	20	0.1	7	0	0	188
124	2009	15	0	7.7	34.2	0	40
125	2009	20	0	8.2	85.5	0	228
126	2009	20	0	8	136.8	0.15	2.94
127	2009	20	0	8	136	0.15	281
128	2009	40	0.2	8.2	0	0	479
129	2009	15	0	7.7	85.5	0.15	161
130	2009	20	0	7.9	68.4	0	152
131	2009	35	0.1	7	85.5	0	146
132	2010	100	0	8.1	68.4	0	220
133	2010	200	0.6	6.8	85.5	0	219
134	2010	140	0	8.1	153.9	0.3	346
135	2010	100	0	8.4	85.5	0	203
136	2010	60	0	7.6	68.4	0	163
137	2010	280	0	8.2	85.55	0.15	422
138	2010	100	0	8.2	119.7	0	257
139	2010	80	0	7.9	51.3	0	196
140	2010	100	0.2	7.6	17.1	0.3	75
141	2010	180	0	8.2	136.8	0	63
142	2010	240	0.1	8.3	85.5	0.15	387
143	2010	80	0.3	7.4	68.4	0.15	118
144	2010	80	0	9.4	17.1	0.15	244
145	2010	60	0	7.1	17.1	0	77

Sample ID	Year	Chloride	Nitrate	pH	Hardness	Total Iron	Conductivity
146	2010	80	1	7.6	136.8	0	152
147	2010	80	0.2	7.4	85.5	0.15	162
148	2010	180	0	7.8	153.9	0	784
149	2010	120	0.3	8	136.8	0	252
150	2010	80	0	7.5	102.6	0.15	182
151	2010	140	0.2	8	34.2	0.15	75
152	2010	140	1	8.1	102.6	0.15	203
153	2010	80	0	8	68.4	0.6	144
154	2010	100	0	8.1	188.1	0.15	326
155	2010	240	0.1	7.5	171	0	404
156	2011	25	0	7.3	49.7	0.15	346
157	2011	20	0	6.4	102.6	0.15	284
158	2011	45	0	6.7	171	0.4	366
159	2011	20	0	6.9	51.3	0	245
160	2011	50	0	7.2	68.4	0	327
161	2011	40	0.5	7	68.4	0.3	341
162	2011	160	0	6.3	17.1	0.15	1080
163	2011	35	0	6.9	68.4	0	309
164	2011	45	0	6.7	68.4	0	429
165	2011	105	0	7.3	136.8	0	699
166	2011	20	1.5	6.4	17.1	0	65
167	2011	25	0	6.8	102.6	0.15	198
168	2011	20	0.5	6.8	17.1	0.15	68
169	2011	15	0	7	34.2	0.15	65
170	2011	15	0	7	119.7	0.15	210
171	2011	20	0.25	6.9	102.6	0.15	243
172	2011	15	0	6.7	68.4	0.3	124
173	2011	20	0.75	7.1	68.4	0	219
174	2011	20	0	7.1	17.1	0	70
175	2011	10	0	6.8	102.6	0.3	179
176	2011	15	0	7.2	51.3	0.3	180
177	2011	20	0	7.4	17.1	0	280
178	2011	20	0.5	6.8	17.1	0.15	68
179	2012	20	0	7.8	273.6		255
180	2012	30	0	7.7	119.7		346
181	2012	25	0.5	7.6	273.6		277
182	2012	140	0	7.35	290.7		700
183	2012	15	0	7.6	0		187
184	2012	25	0	7.9	136.8		186
185	2012	15	0.5	7.25	85.5		177
186	2012	130	0	8.1	444.6		1200

Sample ID	Year	Chloride	Nitrate	pH	Hardness	Total Iron	Conductivity
187	2012	40	0	8.45	222.3		360
188	2012	50	0	7.95	239.4		433
189	2012	120	0.5	7.9	324.9		583
190	2012	25	2	7.85	119.7		103
191	2012	45	0.5	8	342		245
192	2012	20	0.3	7.65	68.4		70
193	2012	15	0	8	153.9		229
194	2012	30	2	7.6	222.3		220
195	2012	15	0	7.65	32.2		148
196	2012	30	0	8.45	205.2		355
197	2012	20	0	7.55	273.6		281
198	2012	35	2	7.15	102.6		627
199	2013	50	0.5	7.5	171		71
200	2013	5	0	8.1	85.1		201
201	2013	25	0	8	85.5		433
202	2013	20	0.5	7.9	68.4		68
203	2013	10	0.5	7.8	51.3		111
204	2013	50	0	8.2	205.2		207
205	2013	20	0	8	153.9		425
206	2013	30	0.5	7.5	102.6		254
207	2013	95	0.5	7.5	188.1		871
208	2013	25	0	7.6	34.2		190
209	2013	50	0	7.8	85.5		328
210	2013	30	0.5	7.9	171		222
211	2013	30	0.5	8.1	222.3		217
212	2013	30	0.5	7.5	119.7		275
213	2013	25	2	7.2	102.6		221
214	2014	40	2	6.5	51.3		321
215	2014	15	0.5	6.4	119.7		23.4
216	2014	60	0.5	6.5	153.9		34.6
217	2014	25	0.5	7.4	102.6		79
218	2014	50	2	6.8	205.2		482
219	2015	30	2	7.1	85.5		122
220	2015	35	7	7	136.8		255
221	2015	40	1	7.1	68.4		456
222	2015	10	0.5	7.2	34.2		289
223	2015	20	0.5	6.9	34.2		208
224	2015	10	0.5	7.2	85.5		134
225	2017	32		8	85.5		113
226	2017	40		8	85.5		123
227	2017	40		8	68.4		123

Sample ID	Year	Chloride	Nitrate	pH	Hardness	Total Iron	Conductivity
228	2017	72		8.4	68.4		222
229	2017	16		5.7	51.3		257
230	2017	8		8.5	85.5		171
231	2017	16		8.5	44.2		185
232	2017	40		8.1	68.4		180
233	2017	43.75		8.2	171		275
234	2017	24		8	136.8		114
235	2017	32		7.9	85.5		177
236	2017	104		8.2	0		521
237	2017	24		8.2	153.9		253
238	2017	24		8.5	51.3		193
239	2017	16		8.8	51.3		101
240	2017	32		7.9	102		177
241	2017	88		7.5	119.7		261
242	2017	16		8	102.6		165
243	2017	8		8.5	34.2		90
244	2017	16		8.2	0		223
245	2017	56		8.3	119.7		291
246	2017	24		8	68.4		190
247	2017	6.4		8.2	51.3		212
248	2017	56		8.6	68.4		344
249	2017	16		8.2	68.4		278
250	2017	16		8.4	34.2		58
251	2017	32		8	171		258
252	2018			8.6	85.5	0.15	483
253	2018			8.9	34.2	0.15	153
254	2018			6.7	1000.0	2.00	124
255	2018			8.5	51.3	0.15	170
256	2018			7.2	117.0	0.15	176
257	2018			7.2	119.7	0.15	176
258	2018			6.9	34.2	0.15	4
259	2018			8.0	102.6	0.15	118
260	2018			7.9	222.3	0.15	191
261	2018			8.2	68.4	0.15	156
262	2018			7.3	0	0.15	127
263	2018			7.8	153.9	0.15	1.92
264	2018			6.9	136.8	0.15	125
265	2018			8.3	85.5	0.30	275
266	2018			7.0	102.6	0.15	162
267	2018			8.2	102.6	0.15	128