

Appendix 1.9. Model Archive Summary for Sodium Concentration at U.S. Geological Survey site 07143672; Little Arkansas River at Highway 50 near Halstead, Kansas, during May 1998 through December 2019

This model archive summary summarizes the sodium model developed to compute hourly or daily sodium. Model development methods follow U.S. Geological Survey (USGS) guidance from Office of Surface Water/Office of Water Quality Technical Memoranda and USGS Techniques and Methods, book 3, chap. C4 (Rasmussen and others, 2009).

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Site and Model Information

Site Number: 07143672

Site Name: Little Arkansas River at Highway 50 near Halstead, Kansas

Location: Latitude 38°01'43", longitude 97°32'25" referenced to North American Datum of 1927, in NW 1/4 NE 1/4 NE 1/4 sec.28, T.23 S., R.2 W., Harvey County, Kansas, hydrologic unit 11030012.

Equipment: A Sutron Satlink II High Data Rate Collection Platform and a Design Analysis Water Log H350/355 nonsubmersible pressure transducer transfers real-time stage and water-quality data via satellite. The primary reference gage is a Type-A wire-weight gage located on the downstream bridge guardrail. Check-bar elevation is 33.396 feet. The orifice tube is enclosed in 1.25-inch steel conduit trenched into the ground down to the edge of water, where the orifice emerges from the bank and culminates in a 2-inch open-end orifice tethered to a steel fencepost near the left edge of water. Gage height was measured during May 1998 through December 2019. A YSI 6600 water-quality monitor equipped with water temperature, specific conductance, pH, dissolved oxygen, and turbidity (a YSI Model 6026 [December 1998 through December 2006] and YSI Model 6136 [July 2004 through December 2017]) sensors collected data during May 1998 through December 2017. A YSI EXO2 water-quality monitor equipped with water temperature, specific conductance, pH, dissolved oxygen, turbidity, and fluorescent dissolved organic matter sensors collected data during January 2017 through December 2019. A Hach Nitratax monitor collected nitrate data during February 2017 through December 2019.

Date model was developed: June 1, 2020

Model calibration data period: May 12, 1998 through December 10, 2019

Model Data

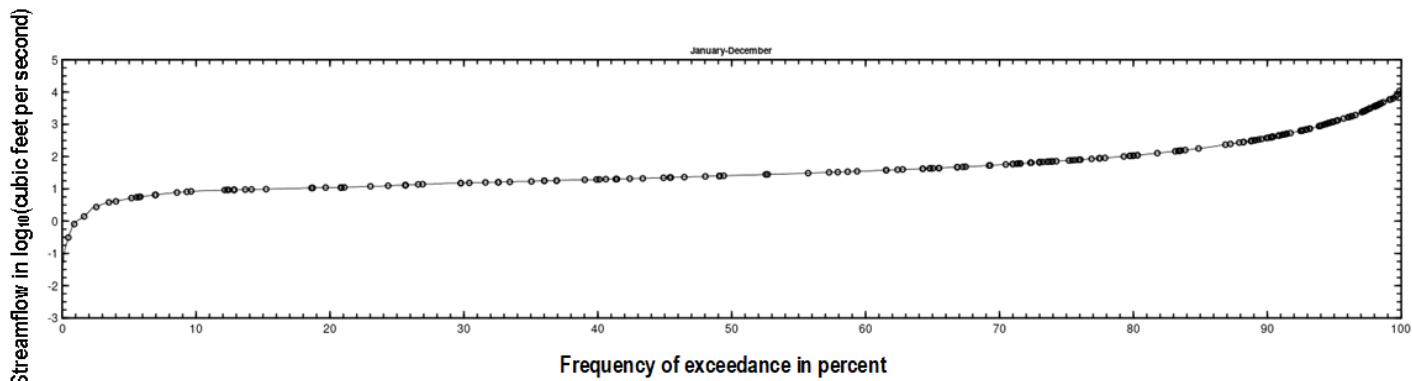
All data were collected using USGS protocols (U.S. Geological Survey, variously dated; Wagner and others, 2006; Sauer and Turnipseed, 2010; Turnipseed and Sauer, 2010) and are stored in the National Water Information System (NWIS) database (U.S. Geological Survey, 2021). Explanatory variables were evaluated individually and in combination. Potential explanatory variables included streamflow, water temperature, specific conductance, pH, dissolved oxygen, YSI EXO2 turbidity, nitrate, and fluorescent dissolved organic matter. Seasonal components (sine and cosine variables) also were evaluated as explanatory variables.

The regression model is based on 190 concomitant values of discretely collected calcium and continuously measured specific conductance during May 1998 through December 2019. Discrete samples were collected over a range of streamflow and specific conductance conditions. No samples had detections that were below laboratory detection limits. Summary statistics and the complete model-calibration dataset are provided below. Outliers and influential points were identified using studentized residuals, DFITS, Cook's D (Cook 1977), and leverage. Outliers in previously published versions of this model (Christensen and others, 2003; Rasmussen and others, 2016) were examined and retained in the dataset if there were no clear issues, explanations, or conditions that would cause a result to be invalid for model calibration. All samples were retained in the dataset.

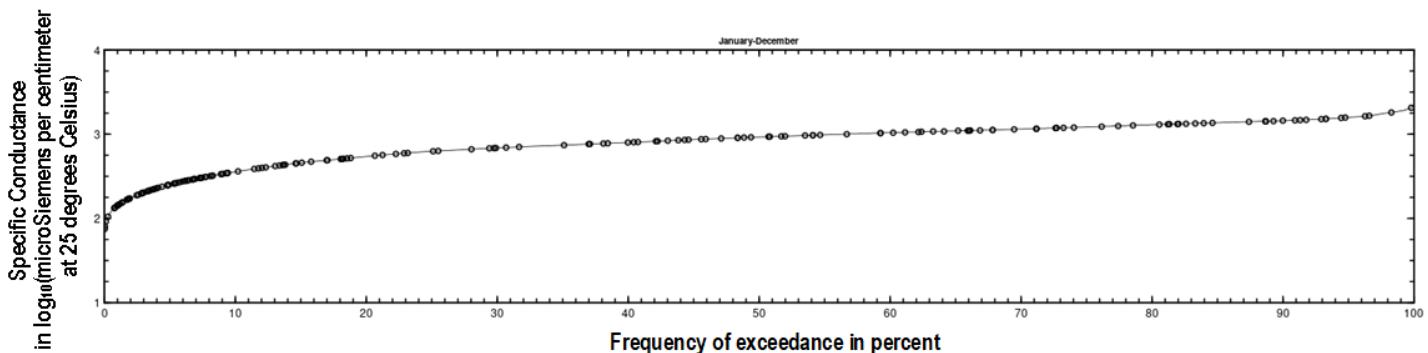
Sodium

Discrete samples were collected from the downstream side of the bridge or instream within 50 feet of the bridge using equal-width-increment, multi-vertical, single vertical or grab-dip methods following U.S. Geological Survey (variously dated) and Rasmussen and others (2014). Discrete samples were collected on a semifixed to event-based schedule ranging from 4 to 13 samples per year with a FISP US DH-95 or D-95 with a Teflon bottle, cap, and nozzle depth-integrating sampler, a DH-81 with a Teflon bottle, cap, and nozzle hand sampler or a grab sample with a Teflon bottle depending on sample location. Samples were analyzed for sodium by the Wichita Municipal Water and Wastewater Laboratory in Wichita, Kansas, or the USGS National Water Quality Laboratory according to standard methods (American Public Health Association and others, 1995).

Sodium Samples Plotted on Streamflow Duration Curve



Sodium Samples Plotted on Specific Conductance Duration Curve



Continuous Data

Concomitant specific conductance values were time interpolated. If no concomitant continuous data were available within 2 hours of sample collection, the sample was not included in the dataset.

Model Development

Ordinary least squares regression analysis was done using R programming language (R Core Team, 2020) to relate discretely collected sodium to specific conductance and other continuously measured data. The distribution of residuals was examined for normality and plots of residuals (the difference between the measured and model-calculated values) compared to model-computed sodium were examined for homoscedasticity (departures from zero did not change substantially over the range of model-calculated values). Previously published explanatory variables were also strongly considered for continuity; however, the best explanatory variable(s) was ultimately selected.

Specific conductance was selected as the best predictor of sodium based on residual plots, high coefficient of determination (R^2), and low model standard percentage error (MSPE). Specific conductance was positively related to sodium because it measures water's capacity to conduct an electrical current and is related to the concentration of ionized substances in water (Hem, 1992).

Model Summary

Summary of final sodium regression analysis at USGS site number 07143672:

Sodium-based model:

$$\log_{10}(NA) = 1.32 \times \log_{10}(SC) - 2.03$$

where,

\log_{10} = logarithm base 10

NA = sodium, in milligrams per liter (mg/L); and

SC = specific conductance, in microsiemens per centimeter at 25 degrees Celsius ($\mu\text{S}/\text{cm}$)

The log-transformed model may be retransformed to original units so that NA can be calculated directly. The retransformation introduces a bias in the calculated constituent. This bias may be corrected using Duan's bias correction factor (BCF; Duan, 1983). For this model, the calculated BCF is 1.02. The retransformed model, accounting for BCF is:

$$NA = 0.0095 \times SC^{1.32}$$

Model Statistics, Data, and Plots

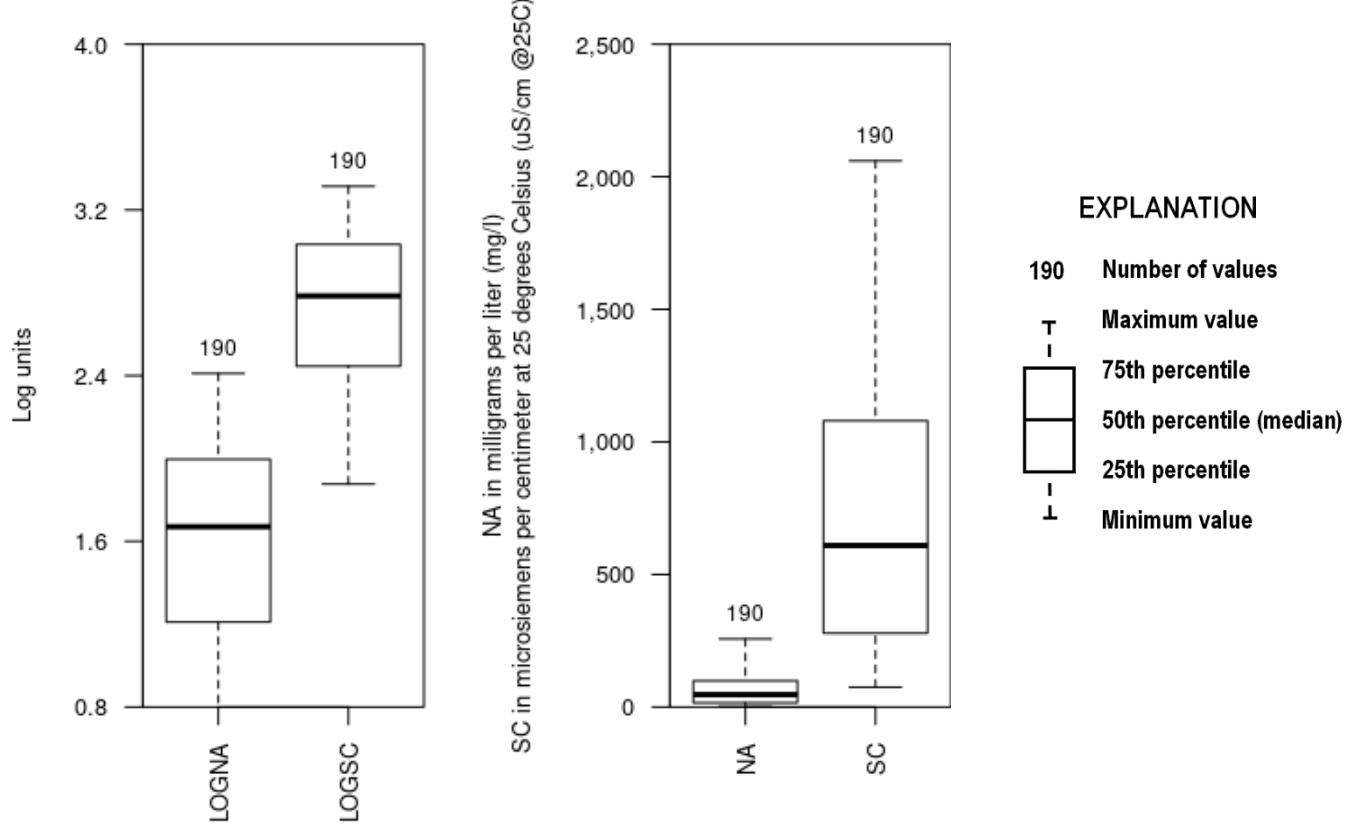
Model

$$\text{LOGNA} = + 1.32 * \text{LOGSC} - 2.03$$

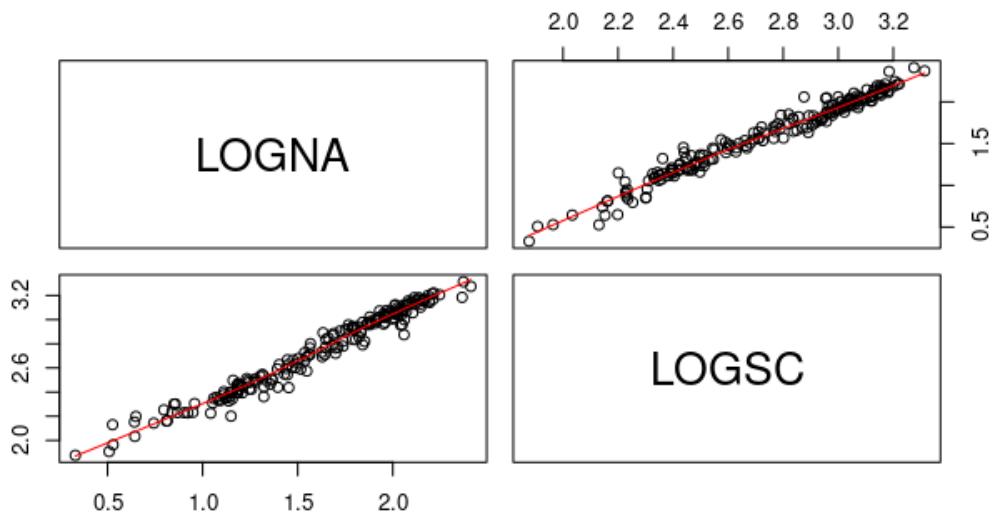
Variable Summary Statistics

	LOGNA	NA.	LOGSC	SC
Minimum	0.33	2.14	1.88	75.2
1st Quartile	1.21	16.20	2.45	279.0
Median	1.67	46.90	2.78	609.0
Mean	1.60	61.10	2.74	706.0
3rd Quartile	2.00	99.10	3.03	1080.0
Maximum	2.41	257.00	3.31	2060.0

Box Plots



Exploratory Plots



Basic Model Statistics

Number of Observations	190
Standard error (RMSE)	0.0823
Average Model standard percentage error (MSPE)	19.1
Coefficient of determination (R^2)	0.967
Adjusted Coefficient of Determination (Adj. R^2)	0.967
Bias Correction Factor (BCF)	1.02

Explanatory Variables

	Coefficients	Standard Error	t value	Pr(> t)
(Intercept)	-2.03	0.0491	-41.3	3.10e-96
LOGSC	1.32	0.0178	74.4	2.28e-141

Correlation Matrix

	Intercept	E.vars
Intercept	1.000	-0.993
E.vars	-0.993	1.000

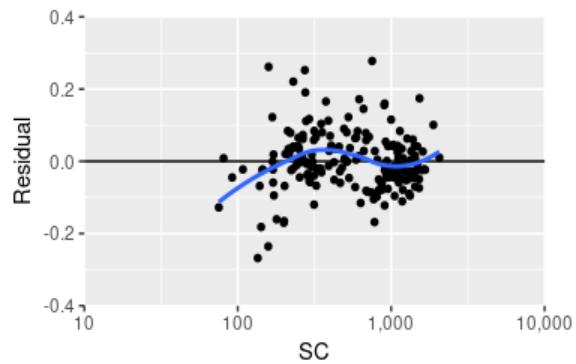
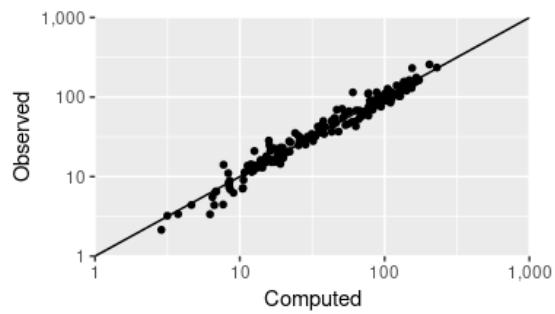
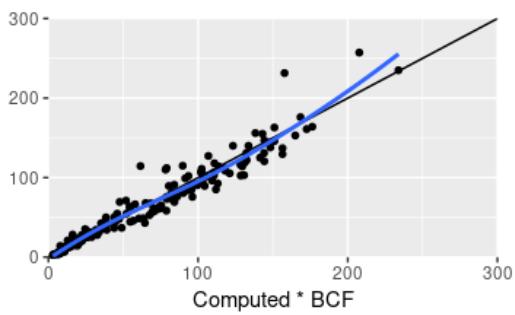
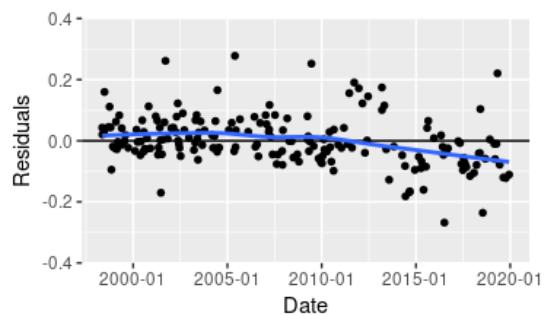
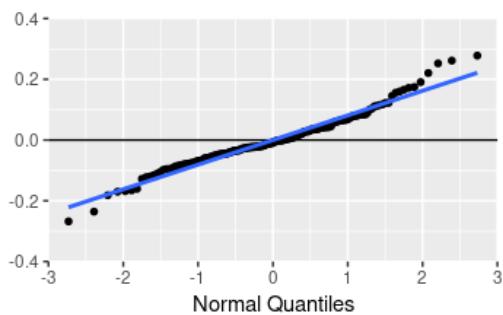
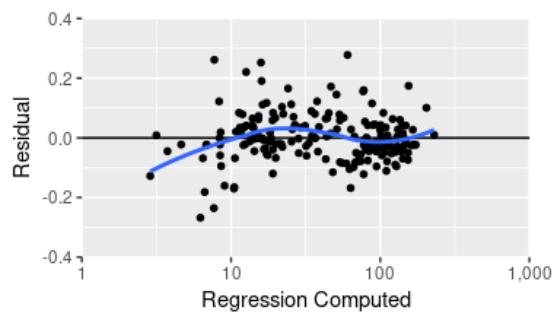
Outlier Test Criteria

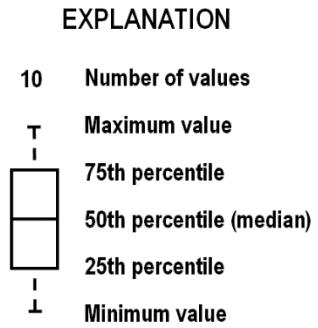
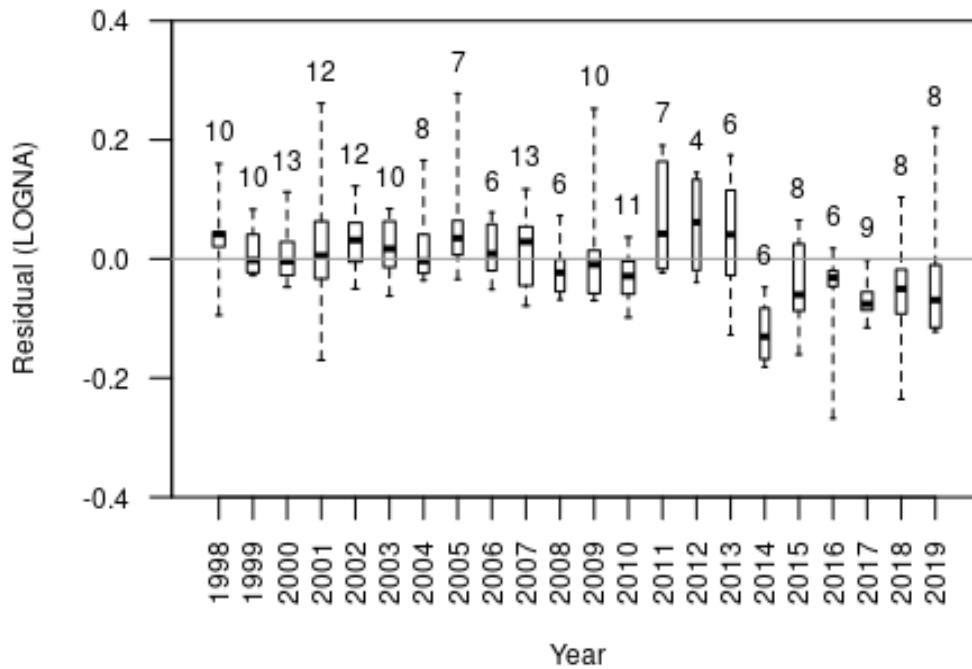
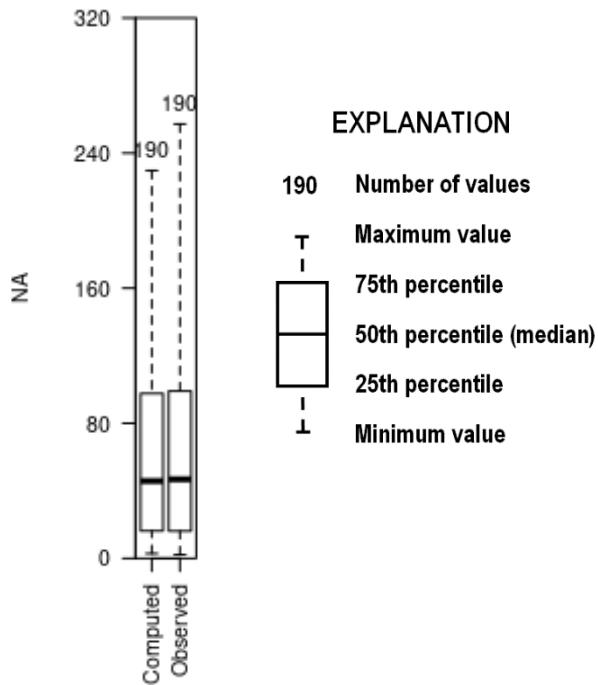
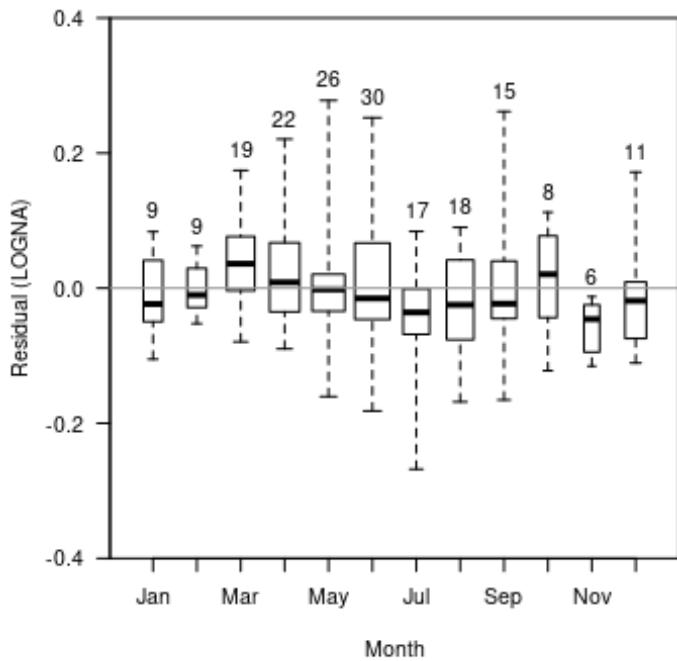
Leverage	Cook's D	DFFITS
0.0316	0.1946	0.2052

Flagged Observations

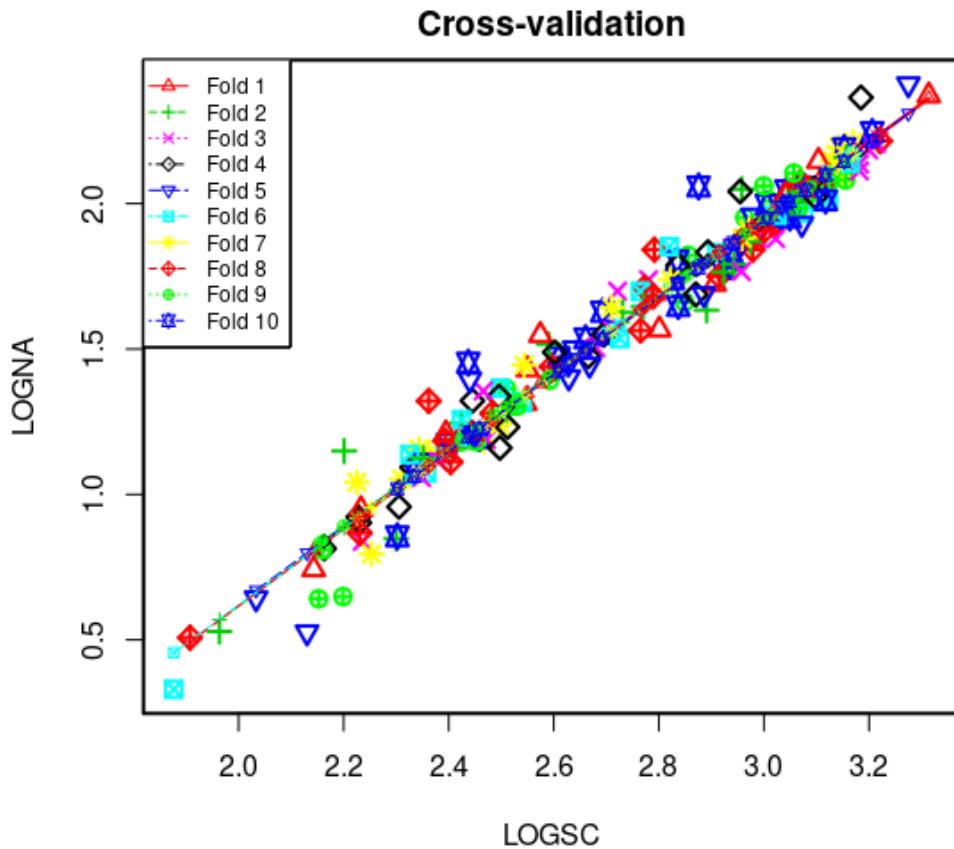
	LOGNA	Estimate	Residual	Standard Residual	Studentized Residual	Residual	Leverage	Cook's D	DFFITS
6/22/2001 10:35	0.849	1.020	-0.17000		-2.080		-2.100	0.01410	0.031100
9/18/2001 12:05	1.150	0.888	0.26200		3.210		3.290	0.01860	0.097800
5/26/2005 12:00	2.060	1.780	0.27800		3.390		3.490	0.00619	0.035700
5/25/2007 10:20	0.529	0.574	-0.04480		-0.554		-0.553	0.03310	0.005260
6/16/2009 10:20	1.450	1.200	0.25200		3.080		3.150	0.00942	0.045200
9/22/2011 10:30	1.390	1.200	0.19100		2.330		2.360	0.00934	0.025600
3/12/2013 9:30	2.360	2.190	0.17400		2.140		2.160	0.01470	0.034100
7/30/2013 10:15	0.330	0.458	-0.12800		-1.590		-1.590	0.03980	0.052100
6/12/2014 9:30	0.641	0.823	-0.18200		-2.230		-2.260	0.02120	0.054000
9/4/2014 11:30	0.856	1.020	-0.16600		-2.030		-2.040	0.01410	0.029300
5/28/2015 10:00	0.796	0.956	-0.16100		-1.970		-1.980	0.01620	0.031800
12/14/2015 10:35	0.508	0.499	0.00851		0.105		0.105	0.03730	0.000216
7/5/2016 10:00	0.526	0.794	-0.26800		-3.290		-3.380	0.02240	0.124000
7/18/2018 10:20	0.649	0.885	-0.23600		-2.890		-2.950	0.01870	0.080000
4/29/2019 13:05	1.320	1.100	0.22100		2.700		2.740	0.01180	0.043400

Statistical Plots

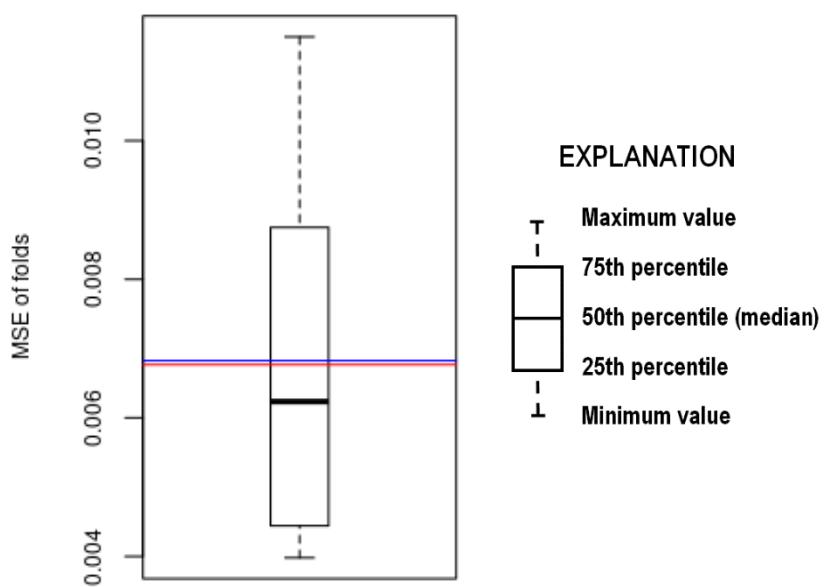




Cross Validation



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Minimum MSE of folds: 0.00398
Mean MSE of folds: 0.00682
Median MSE of folds: 0.00624
Maximum MSE of folds: 0.01150
(Mean MSE of folds) / (Model MSE): 1.01000
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Red line - Model MSE

Blue line - Mean MSE of folds

Model-Calibration Dataset

ID	Date	LOGNA	LOGSC	NA	SC	Computed		Residual	Normal Quantiles
						LOGNA	NA		
1	5/12/1998	2.05	3.04	111	1100	2	102	0.0429	0.724
2	5/14/1998	1.05	2.31	11.3	204	1.03	11	0.0205	0.385
3	6/15/1998	2.03	3.04	106	1100	2	102	0.0236	0.399
4	6/25/1998	2.05	2.96	112	907	1.89	79	0.16	1.69
5	7/13/1998	1.54	2.66	34.4	458	1.5	31.9	0.0403	0.625
6	9/14/1998	2.01	3.01	102	1030	1.96	93.6	0.0455	0.777
7	10/1/1998	1.32	2.45	21	279	1.21	16.6	0.111	1.36
8	10/22/1998	1.47	2.61	29.6	406	1.43	27.3	0.0436	0.759
9	11/6/1998	0.839	2.24	6.9	172	0.933	8.74	-0.0946	-1.36
10	12/3/1998	1.91	2.99	82.1	978	1.93	87.3	-0.0186	-0.126
11	1/6/1999	2.21	3.22	164	1660	2.24	176	-0.0235	-0.287
12	2/1/1999	1.25	2.42	17.6	266	1.18	15.5	0.0622	0.869
13	2/19/1999	2.09	3.13	122	1340	2.11	132	-0.0278	-0.399
14	3/11/1999	2.16	3.16	144	1460	2.16	148	-0.00369	0.0461
15	4/7/1999	1.74	2.78	54.7	603	1.65	46	0.0832	1.15
16	5/20/1999	1.96	3.02	90.6	1040	1.97	95.2	-0.0137	-0.0858
17	5/24/1999	1.14	2.36	13.9	231	1.1	12.9	0.0412	0.641
18	7/19/1999	0.922	2.23	8.36	169	0.923	8.53	-0.0008	0.126
19	8/4/1999	0.949	2.23	8.89	171	0.93	8.67	0.0188	0.371
20	9/28/1999	0.814	2.16	6.52	145	0.837	7	-0.023	-0.246
21	2/8/2000	2.12	3.15	131	1430	2.15	144	-0.0334	-0.442
22	3/6/2000	1.18	2.39	15.1	247	1.14	14.1	0.0363	0.577
23	3/27/2000	1.15	2.4	14.1	252	1.15	14.5	-0.00386	0.033
24	5/19/2000	2.06	3.12	114	1320	2.1	129	-0.0473	-0.707
25	5/30/2000	1.45	2.63	28.2	424	1.45	28.9	-0.00255	0.0593
26	6/26/2000	1.36	2.51	23.1	323	1.3	20.2	0.0669	0.97
27	7/19/2000	1.92	3.01	84.1	1030	1.96	93	-0.0358	-0.516
28	7/27/2000	1.44	2.6	27.5	394	1.41	26.2	0.0288	0.457
29	8/15/2000	1.96	3.03	91.9	1080	1.99	99.5	-0.0265	-0.357
30	9/7/2000	1.98	3.04	94.9	1110	2	103	-0.0276	-0.371
31	9/25/2000	2.06	3.08	114	1200	2.05	114	0.00841	0.26
32	10/27/2000	1.52	2.59	32.8	389	1.4	25.8	0.112	1.39
33	11/30/2000	2.18	3.2	153	1580	2.21	165	-0.0247	-0.343
34	3/13/2001	1.43	2.55	26.9	355	1.35	22.8	0.08	1.1
35	4/12/2001	1.71	2.77	51.4	593	1.64	45	0.066	0.949
36	4/26/2001	2.1	3.15	125	1410	2.14	141	-0.0456	-0.674
37	5/9/2001	2.21	3.21	161	1640	2.23	173	-0.0221	-0.206
38	6/1/2001	2	3.01	99.1	1010	1.95	91.4	0.043	0.741
39	6/11/2001	1.14	2.39	13.9	247	1.14	14.1	0.00184	0.165
40	6/22/2001	0.849	2.3	7.06	200	1.02	10.6	-0.17	-2.08
41	7/12/2001	1.88	2.99	76.3	968	1.93	86.1	-0.0443	-0.609
42	8/1/2001	2.12	3.13	131	1340	2.11	132	0.00388	0.179
43	8/30/2001	2.19	3.14	156	1380	2.13	138	0.0603	0.85
44	9/18/2001	1.15	2.2	14.1	159	0.888	7.86	0.262	2.39
45	10/30/2001	2.01	3.05	103	1110	2.01	103	0.00729	0.246
46	1/9/2002	2.21	3.17	163	1480	2.17	151	0.0412	0.657
47	2/20/2002	2.19	3.15	155	1420	2.15	143	0.0428	0.707
48	4/10/2002	2.15	3.13	140	1350	2.12	134	0.028	0.428
49	4/22/2002	1.16	2.34	14.3	221	1.08	12.1	0.0788	1.08
50	5/14/2002	1.7	2.72	50	526	1.58	38.4	0.122	1.55
51	5/23/2002	1.56	2.71	36.5	513	1.56	37.1	0.000509	0.139
52	6/6/2002	2.03	3.07	106	1170	2.04	111	-0.0105	-0.033
53	6/17/2002	0.81	2.16	6.45	144	0.833	6.94	-0.0238	-0.301
54	7/9/2002	1.79	2.92	61.4	830	1.84	70.2	-0.0503	-0.759
55	8/20/2002	1.63	2.69	42.5	493	1.54	35.2	0.0901	1.26
56	9/18/2002	2.07	3.07	118	1170	2.04	111	0.0348	0.562
57	12/17/2002	2.37	3.31	235	2060	2.36	234	0.01	0.287
58	3/24/2003	1.31	2.55	20.6	351	1.34	22.5	-0.0304	-0.428

59	4/16/2003	2.16	3.17	146	1480	2.17	151	-0.0066	0.0198
60	4/22/2003	1.82	2.86	66.4	718	1.75	57.9	0.0674	0.991
61	5/15/2003	1.37	2.5	23.2	315	1.28	19.5	0.0841	1.24
62	5/28/2003	1.55	2.7	35.4	496	1.54	35.5	0.00718	0.233
63	6/10/2003	1.8	2.94	62.8	862	1.86	73.8	-0.0623	-0.928
64	6/24/2003	2.25	3.21	176	1610	2.22	168	0.027	0.413
65	7/30/2003	2.15	3.1	140	1270	2.08	123	0.0632	0.888
66	9/2/2003	1.24	2.48	17.5	302	1.26	18.4	-0.0141	-0.099
67	10/15/2003	1.12	2.35	13.1	223	1.08	12.3	0.0339	0.501
68	3/9/2004	1.08	2.33	12.1	216	1.06	11.8	0.0183	0.357
69	3/29/2004	2.01	3.07	103	1170	2.04	111	-0.0234	-0.26
70	4/26/2004	2.17	3.16	147	1430	2.15	144	0.0155	0.329
71	5/13/2004	1.7	2.76	49.9	581	1.63	43.8	0.0643	0.908
72	5/26/2004	1.87	2.96	73.3	907	1.89	79	-0.0245	-0.315
73	6/16/2004	1.87	2.97	73.6	928	1.9	81.4	-0.036	-0.531
74	6/21/2004	1.55	2.57	35.3	375	1.38	24.6	0.166	1.75
75	7/26/2004	0.643	2.03	4.4	108	0.666	4.72	-0.0225	-0.219
76	1/28/2005	1.5	2.64	31.8	435	1.47	29.9	0.0348	0.547
77	3/25/2005	1.34	2.5	21.7	313	1.28	19.3	0.0587	0.831
78	5/11/2005	2.07	3.12	116	1310	2.1	128	-0.0341	-0.472
79	5/26/2005	2.06	2.88	115	751	1.78	61.5	0.278	2.73
80	6/7/2005	1.32	2.54	20.7	347	1.34	22.1	-0.0206	-0.179
81	6/14/2005	1.09	2.33	12.4	214	1.06	11.7	0.0343	0.516
82	8/31/2005	1.49	2.6	30.8	400	1.42	26.7	0.0703	1.01
83	2/7/2006	2.03	3.04	107	1100	2	102	0.0294	0.486
84	6/8/2006	1.8	2.83	63.8	683	1.73	54.2	0.0782	1.06
85	6/26/2006	1.28	2.51	19	324	1.3	20.2	-0.0197	-0.152
86	7/28/2006	1.11	2.38	13	240	1.13	13.6	-0.012	-0.0593
87	8/23/2006	1.4	2.63	25.3	425	1.45	29	-0.0512	-0.777
88	9/27/2006	1.79	2.84	61.3	686	1.73	54.6	0.0583	0.813
89	1/10/2007	2.1	3.06	127	1140	2.02	107	0.0837	1.18
90	1/30/2007	1.95	2.96	89.5	920	1.9	80.4	0.0542	0.794
91	3/12/2007	1.74	2.82	54.7	663	1.71	52.2	0.0288	0.472
92	3/21/2007	1.63	2.73	42.3	538	1.59	39.6	0.0365	0.593
93	3/27/2007	1.36	2.47	22.7	292	1.24	17.6	0.117	1.46
94	4/18/2007	1.19	2.42	15.5	263	1.18	15.3	0.0132	0.301
95	5/25/2007	0.529	1.96	3.38	92	0.574	3.82	-0.0448	-0.641
96	7/11/2007	1.14	2.33	13.7	212	1.05	11.5	0.0841	1.21
97	8/13/2007	1.84	2.98	69.3	952	1.92	84.2	-0.0762	-1.1
98	9/5/2007	1.93	3.02	84.5	1050	1.97	95.5	-0.0453	-0.657
99	11/27/2007	1.96	3.03	90.4	1080	1.99	99.5	-0.0337	-0.457
100	12/4/2007	1.97	3.08	92.6	1190	2.05	113	-0.0789	-1.15
101	12/12/2007	1.19	2.4	15.3	251	1.15	14.4	0.0345	0.531
102	3/4/2008	1.26	2.42	18.1	266	1.18	15.5	0.0731	1.03
103	4/14/2008	1.56	2.71	36.5	515	1.56	37.3	-0.00113	0.112
104	5/29/2008	1.27	2.49	18.5	308	1.27	18.9	-0.00137	0.0858
105	6/30/2008	1.18	2.47	15.3	293	1.24	17.7	-0.055	-0.813
106	9/16/2008	1.11	2.4	12.9	253	1.16	14.6	-0.0445	-0.625
107	10/17/2008	0.958	2.31	9.07	202	1.03	10.8	-0.0683	-0.991
108	4/1/2009	1.64	2.71	43.9	513	1.56	37.1	0.0802	1.13
109	4/6/2009	1.83	2.91	67.7	813	1.83	68.3	0.00426	0.192
110	4/13/2009	1.68	2.79	47.9	615	1.67	47.2	0.0144	0.315
111	4/30/2009	1.19	2.46	15.7	287	1.23	17.2	-0.0342	-0.486
112	5/12/2009	1.18	2.42	15.1	265	1.18	15.5	-0.00134	0.099
113	6/16/2009	1.45	2.44	28.4	274	1.2	16.2	0.252	2.21
114	7/30/2009	1.5	2.68	31.9	478	1.52	33.9	-0.0176	-0.112
115	11/2/2009	1.19	2.47	15.4	296	1.25	18	-0.0579	-0.85
116	12/1/2009	1.95	3.05	89.5	1120	2.01	104	-0.0587	-0.869
117	12/17/2009	2.08	3.16	121	1430	2.15	144	-0.07	-1.01
118	1/6/2010	2.11	3.18	130	1520	2.19	156	-0.0739	-1.06
119	1/19/2010	2.14	3.18	137	1520	2.19	156	-0.0496	-0.741

120	2/11/2010	2.16	3.16	144	1430	2.15	145	0.00471	0.219
121	2/23/2010	2.04	3.09	109	1230	2.06	118	-0.0286	-0.413
122	4/13/2010	2.07	3.12	119	1330	2.11	131	-0.0349	-0.501
123	6/1/2010	1.83	2.89	68.1	782	1.8	64.9	0.0284	0.442
124	6/15/2010	1.07	2.36	11.9	228	1.1	12.7	-0.0211	-0.192
125	7/7/2010	0.743	2.14	5.53	139	0.811	6.59	-0.0683	-0.97
126	8/19/2010	1.72	2.91	52.9	806	1.82	67.5	-0.0983	-1.46
127	8/25/2010	1.12	2.35	13.3	225	1.09	12.5	0.0367	0.609
128	11/16/2010	1.39	2.59	24.7	391	1.41	25.9	-0.0125	-0.0725
129	1/19/2011	2.14	3.16	138	1460	2.16	148	-0.0234	-0.274
130	3/7/2011	1.96	2.98	91	951	1.92	84.1	0.0422	0.69
131	5/16/2011	2.05	3.09	112	1220	2.06	117	-0.0107	-0.0461
132	6/20/2011	2.04	2.95	110	901	1.89	78.3	0.156	1.64
133	8/11/2011	0.903	2.23	8	170	0.926	8.59	-0.0228	-0.233
134	9/22/2011	1.39	2.44	24.8	275	1.2	16.3	0.191	1.97
135	12/21/2011	1.84	2.79	69.4	619	1.67	47.6	0.172	1.82
136	3/1/2012	1.04	2.23	11	168	0.92	8.47	0.122	1.5
137	4/18/2012	1.24	2.5	17.4	315	1.28	19.4	-0.0394	-0.562
138	5/29/2012	1.91	2.97	81	936	1.91	82.3	0.000916	0.152
139	6/18/2012	1.85	2.82	71.1	660	1.71	51.8	0.145	1.59
140	3/12/2013	2.36	3.18	231	1530	2.19	158	0.174	1.89
141	3/13/2013	2.41	3.27	257	1880	2.31	208	0.101	1.29
142	4/29/2013	2.06	3	115	999	1.94	89.7	0.115	1.43
143	6/3/2013	1.48	2.67	29.9	463	1.5	32.4	-0.0277	-0.385
144	7/30/2013	0.33	1.88	2.14	75.2	0.458	2.92	-0.128	-1.75
145	10/30/2013	1.96	3.03	91.2	1060	1.98	97	-0.0188	-0.139
146	4/9/2014	1.98	3.06	96.3	1160	2.03	109	-0.0473	-0.724
147	6/4/2014	1.75	2.91	56.2	822	1.83	69.3	-0.0826	-1.24
148	6/12/2014	0.641	2.15	4.38	142	0.823	6.78	-0.182	-2.21
149	8/28/2014	1.63	2.89	43	778	1.8	64.5	-0.168	-1.97
150	9/4/2014	0.856	2.3	7.18	201	1.02	10.7	-0.166	-1.89
151	12/10/2014	2.01	3.12	103	1330	2.11	131	-0.0954	-1.39
152	2/25/2015	2.02	3.1	105	1250	2.08	121	-0.0524	-0.794
153	4/7/2015	2.01	3.12	103	1310	2.1	128	-0.0899	-1.33
154	4/20/2015	1.23	2.51	17.1	325	1.3	20.3	-0.0675	-0.949
155	5/28/2015	0.796	2.25	6.25	179	0.956	9.21	-0.161	-1.82
156	7/14/2015	1.66	2.85	45.8	706	1.75	56.7	-0.0848	-1.26
157	8/6/2015	1.18	2.39	15.3	247	1.14	14.1	0.0418	0.674
158	8/27/2015	1.21	2.39	16.2	248	1.14	14.2	0.0651	0.928
159	12/14/2015	0.508	1.91	3.22	80.8	0.499	3.22	0.00851	0.274
160	5/2/2016	1.28	2.48	19	304	1.26	18.6	0.0178	0.343
161	6/1/2016	1.3	2.53	20.1	339	1.32	21.4	-0.0198	-0.165
162	6/16/2016	1.54	2.73	34.4	532	1.58	38.9	-0.0463	-0.69
163	7/5/2016	0.526	2.13	3.36	135	0.794	6.34	-0.268	-2.73
164	8/10/2016	1.18	2.45	15.2	283	1.22	16.9	-0.0385	-0.547
165	9/12/2016	1.06	2.35	11.4	223	1.08	12.3	-0.0245	-0.329
166	3/30/2017	1.21	2.44	16.2	279	1.21	16.5	-0.00159	0.0725
167	5/3/2017	1.21	2.45	16.2	282	1.22	16.8	-0.00743	0.00659
168	5/30/2017	1.78	2.94	60.9	862	1.86	73.8	-0.0757	-1.08
169	6/27/2017	1.88	3.02	75.7	1050	1.98	96.2	-0.0959	-1.43
170	7/12/2017	1.81	2.94	65.1	876	1.87	75.4	-0.0554	-0.831
171	8/1/2017	1.56	2.77	36.6	583	1.63	43.9	-0.0713	-1.03
172	8/17/2017	1.65	2.84	44.5	687	1.73	54.6	-0.0815	-1.21
173	9/5/2017	1.69	2.87	48.7	742	1.77	60.5	-0.0862	-1.29
174	11/14/2017	1.57	2.8	36.9	632	1.68	49	-0.115	-1.59
175	1/30/2018	1.69	2.89	48.9	769	1.79	63.4	-0.105	-1.5
176	3/21/2018	1.76	2.92	58.2	838	1.84	71.1	-0.0794	-1.18
177	5/1/2018	1.87	2.97	74.1	943	1.91	83.1	-0.0419	-0.593
178	5/22/2018	1.91	3	80.7	1000	1.95	90.1	-0.0399	-0.577
179	6/2/2018	1.45	2.54	27.9	350	1.34	22.4	0.104	1.33
180	7/18/2018	0.649	2.2	4.46	158	0.885	7.81	-0.236	-2.39

181	9/6/2018	0.868	2.23	7.38	170	0.927	8.6	-0.0588	-0.888
182	12/3/2018	1.65	2.77	44.3	589	1.64	44.6	0.00451	0.206
183	2/26/2019	2.01	3.05	101	1130	2.02	106	-0.0101	-0.0198
184	3/14/2019	1.45	2.67	27.9	466	1.51	32.7	-0.0599	-0.908
185	4/10/2019	1.88	2.96	76	909	1.89	79.2	-0.0101	-0.00659
186	4/29/2019	1.32	2.36	21	230	1.1	12.8	0.221	2.08
187	6/11/2019	1.79	2.94	61.8	876	1.87	75.4	-0.0784	-1.13
188	8/21/2019	1.16	2.5	14.5	314	1.28	19.4	-0.12	-1.64
189	10/8/2019	1.77	2.96	58.4	906	1.89	78.8	-0.122	-1.69
190	12/10/2019	1.93	3.07	85.1	1180	2.04	112	-0.111	-1.55

Definitions

NA: Sodium in mg/L (00930)

SC: Specific conductance in $\mu\text{S}/\text{cm}$ @25C (00095)

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