

# **Evaluating Wastewater Quality Parameters as an Alternative or Complement to Molecular Indicators for Normalization during SARS-CoV-2 Wastewater-Based Epidemiology**

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**Table S1.** Sample light absorbance ratios used to evaluate DOC properties. References are listed in manuscript, numbers 52 – 59

<b>Ratios</b>	<b>Wavelengths</b>	<b>Reference</b>
E2 : E3	250 : 365	(Peuravuori & Pihlaja, 1997)
aE2 : E4	252 : 452	(Graham, Gavin, Kirika, & Farmer, 2021)
bE2 : E4	254 : 436	(Selberg, Viik, Ehapalu, & Tenno, 2011)
cE2 : E4	254 : 465	(Park, Joe, Han, & Kim, 1999)
aE4 : E6	400 : 600	(Moore, 1987)
bE4 : E6	450 : 650	(Wilson, et al., 2011)
cE4 : E6	460 : 660	(Thurman, 1985)
dE4 : E6	465 : 665	(Wallage, Holden, & McDonald, 2006)

**Table S2.** Average wastewater parameters for the six campus sites during the study + standard deviations.

Site	Total Coliforms (CFU/mL)	<i>E.coli</i> (CFU/mL)	ORP (mV)	Electrical conductivity ( $\mu$ S/cm)	Absolute EC ( $\mu$ S/cm)	Resistivity ( $K\Omega \cdot \text{cm}$ )	TDS (ppt)	Salinity (PSU)
1	29511 $\pm$ 26869	8255 $\pm$ 8441	115 $\pm$ 83.8	837 $\pm$ 435	802 $\pm$ 382	1.41 $\pm$ 0.53	0.41 $\pm$ 0.21	0.41 $\pm$ 0.22
2	340231 $\pm$ 235813	42779 $\pm$ 34991	39.7 $\pm$ 75.7	685 $\pm$ 145	660 $\pm$ 152	1.54 $\pm$ 0.47	0.34 $\pm$ 0.07	0.33 $\pm$ 0.07
3	108982 $\pm$ 80743	16684 $\pm$ 20226	58.3 $\pm$ 93.0	628 $\pm$ 121	596 $\pm$ 99.9	1.64 $\pm$ 0.30	0.31 $\pm$ 0.06	0.30 $\pm$ 0.06
4	160797 $\pm$ 121079	39003 $\pm$ 28506	40.4 $\pm$ 53.6	712 $\pm$ 145	672 $\pm$ 114	1.45 $\pm$ 0.26	0.35 $\pm$ 0.07	0.34 $\pm$ 0.07
5	751499 $\pm$ 1490024	97734 $\pm$ 226839	-13.5 $\pm$ 140.	649 $\pm$ 234	646 $\pm$ 232	1.75 $\pm$ 0.72	0.32 $\pm$ 0.11	0.31 $\pm$ 0.11
6	60069 $\pm$ 43219	23689 $\pm$ 30747	72.0 $\pm$ 61.5	644 $\pm$ 68.6	604 $\pm$ 49.1	1.56 $\pm$ 0.16	0.32 $\pm$ 0.03	0.31 $\pm$ 0.03

Eq. S1	SARS-CoV-2
Eq. S2	SARS-CoV-2/pH
Eq. S3	SARS-CoV-2/Temperature_MIN
Eq. S4	SARS-CoV-2/Temperature_MAX
Eq. S5	SARS-CoV-2/Temperature_AVG
Eq. S6	SARS-CoV-2/Total Suspended Solids
Eq. S7	SARS-CoV-2*pH
Eq. S8	SARS-CoV-2*Temperature_MIN
Eq. S9	SARS-CoV-2*Temperature_MAX
Eq. S10	SARS-CoV-2*Temperature_AVG
Eq. S11	SARS-CoV-2*Total Suspended Solids
Eq. S12	SARS-CoV-2*Flow
Eq. S13	SARS-CoV-2*Flow/pH
Eq. S14	SARS-CoV-2*Flow/Temperature_MIN
Eq. S15	SARS-CoV-2*Flow/Temperature_MAX
Eq. S16	SARS-CoV-2*Flow/Temperature_AVG
Eq. S17	SARS-CoV-2*Flow/Total Suspended Solids
Eq. S18	SARS-CoV-2*Flow*pH
Eq. S19	SARS-CoV-2*Flow*Temperature_MIN
Eq. S20	SARS-CoV-2*Flow*Temperature_MAX
Eq. S21	SARS-CoV-2*Flow*Temperature_AVG
Eq. S22	SARS-CoV-2*Flow*Total Suspended Solids
Eq. S23	(SARS-CoV-2/PMMoV)
Eq. S24	(SARS-CoV-2/PMMoV)/pH
Eq. S25	(SARS-CoV-2/PMMoV)/Temperature_MIN
Eq. S26	(SARS-CoV-2/PMMoV)/Temperature_MAX
Eq. S27	(SARS-CoV-2/PMMoV)/Temperature_AVG
Eq. S28	(SARS-CoV-2/PMMoV)/Total Suspended Solids
Eq. S29	(SARS-CoV-2/PMMoV)*pH
Eq. S30	(SARS-CoV-2/PMMoV)*Temperature_MIN
Eq. S31	(SARS-CoV-2/PMMoV)*Temperature_MAX
Eq. S32	(SARS-CoV-2/PMMoV)*Temperature_AVG
Eq. S33	(SARS-CoV-2/PMMoV)*Total Suspended Solids
Eq. S34	(SARS-CoV-2/PMMoV)*Flow
Eq. S35	(SARS-CoV-2/PMMoV)*Flow/pH
Eq. S36	(SARS-CoV-2/PMMoV)*Flow/Temperature_MIN
Eq. S37	(SARS-CoV-2/PMMoV)*Flow/Temperature_MAX
Eq. S38	(SARS-CoV-2/PMMoV)*Flow/Temperature_AVG
Eq. S39	(SARS-CoV-2/PMMoV)*Flow/Total Suspended Solids
Eq. S40	(SARS-CoV-2/PMMoV)*Flow*pH
Eq. S41	(SARS-CoV-2/PMMoV)*Flow*Temperature_MIN
Eq. S42	(SARS-CoV-2/PMMoV)*Flow*Temperature_MAX
Eq. S43	(SARS-CoV-2/PMMoV)*Flow*Temperature_AVG
Eq. S44	(SARS-CoV-2/PMMoV)*Flow*Total Suspended Solids

Eq. S45	SARS-CoV-2/Turbidity	Eq. S87	(SARS-CoV-2/PMMoV)/Turbidity
Eq. S46	SARS-CoV-2/DOC	Eq. S88	(SARS-CoV-2/PMMoV)/DOC
Eq. S47	SARS-CoV-2/Total Coliforms	Eq. S89	(SARS-CoV-2/PMMoV)/Total Coliforms
Eq. S48	SARS-CoV-2/ <i>E. coli</i>	Eq. S90	(SARS-CoV-2/PMMoV)/ <i>E. coli</i>
Eq. S49	SARS-CoV-2/mV_pH	Eq. S91	(SARS-CoV-2/PMMoV)/mV_pH
Eq. S50	SARS-CoV-2/ORP_mV	Eq. S92	(SARS-CoV-2/PMMoV)/ORP_mV
Eq. S51	SARS-CoV-2/EC	Eq. S93	(SARS-CoV-2/PMMoV)/EC
Eq. S52	SARS-CoV-2/EC_Abs	Eq. S94	(SARS-CoV-2/PMMoV)/EC_Abs
Eq. S53	SARS-CoV-2/Resistivity	Eq. S95	(SARS-CoV-2/PMMoV)/Resistivity
Eq. S54	SARS-CoV-2/Pressure	Eq. S96	(SARS-CoV-2/PMMoV)/Pressure
Eq. S55	SARS-CoV-2*Turbidity	Eq. S97	(SARS-CoV-2/PMMoV)*Turbidity
Eq. S56	SARS-CoV-2*DOC	Eq. S98	(SARS-CoV-2/PMMoV)*DOC
Eq. S57	SARS-CoV-2*Total Coliforms	Eq. S99	(SARS-CoV-2/PMMoV)*Total Coliforms
Eq. S58	SARS-CoV-2* <i>E. coli</i>	Eq. S100	(SARS-CoV-2/PMMoV)* <i>E. coli</i>
Eq. S59	SARS-CoV-2*mV_pH	Eq. S101	(SARS-CoV-2/PMMoV)*mV_pH
Eq. S60	SARS-CoV-2*ORP_mV	Eq. S102	(SARS-CoV-2/PMMoV)*ORP_mV
Eq. S61	SARS-CoV-2*EC	Eq. S103	(SARS-CoV-2/PMMoV)*EC
Eq. S62	SARS-CoV-2*EC_Abs	Eq. S104	(SARS-CoV-2/PMMoV)*EC_Abs
Eq. S63	SARS-CoV-2*Resistivity	Eq. S105	(SARS-CoV-2/PMMoV)*Resistivity
Eq. S64	SARS-CoV-2*Pressure	Eq. S106	(SARS-CoV-2/PMMoV)*Pressure
Eq. S65	SARS-CoV-2/(E2:E3)	Eq. S107	(SARS-CoV-2/PMMoV)/(E2:E3)
Eq. S66	SARS-CoV-2/(aE2:E4)	Eq. S108	(SARS-CoV-2/PMMoV)/(aE2:E4)
Eq. S67	SARS-CoV-2/(bE2:E4)	Eq. S109	(SARS-CoV-2/PMMoV)/(bE2:E4)
Eq. S68	SARS-CoV-2/(cE2:E4)	Eq. S110	(SARS-CoV-2/PMMoV)/(cE2:E4)
Eq. S69	SARS-CoV-2/(aE4:E6)	Eq. S111	(SARS-CoV-2/PMMoV)/(aE4:E6)
Eq. S70	SARS-CoV-2/(bE4:E6)	Eq. S112	(SARS-CoV-2/PMMoV)/(bE4:E6)
Eq. S71	SARS-CoV-2/(cE4:E6)	Eq. S113	(SARS-CoV-2/PMMoV)/(cE4:E6)
Eq. S72	SARS-CoV-2/(dE4:E6)	Eq. S114	(SARS-CoV-2/PMMoV)/(dE4:E6)
Eq. S73	SARS-CoV-2/SUVA254	Eq. S115	(SARS-CoV-2/PMMoV)/SUVA254
Eq. S74	SARS-CoV-2/SUVA280	Eq. S116	(SARS-CoV-2/PMMoV)/SUVA280
Eq. S75	SARS-CoV-2/SUVA400	Eq. S117	(SARS-CoV-2/PMMoV)/SUVA400
Eq. S76	SARS-CoV-2*(E2:E3)	Eq. S118	(SARS-CoV-2/PMMoV)*(E2:E3)
Eq. S77	SARS-CoV-2*(aE2:E4)	Eq. S119	(SARS-CoV-2/PMMoV)*(aE2:E4)
Eq. S78	SARS-CoV-2*(bE2:E4)	Eq. S120	(SARS-CoV-2/PMMoV)*(bE2:E4)
Eq. S79	SARS-CoV-2*(cE2:E4)	Eq. S121	(SARS-CoV-2/PMMoV)*(cE2:E4)
Eq. S80	SARS-CoV-2*(aE4:E6)	Eq. S122	(SARS-CoV-2/PMMoV)*(aE4:E6)
Eq. S81	SARS-CoV-2*(bE4:E6)	Eq. S123	(SARS-CoV-2/PMMoV)*(bE4:E6)
Eq. S82	SARS-CoV-2*(cE4:E6)	Eq. S124	(SARS-CoV-2/PMMoV)*(cE4:E6)
Eq. S83	SARS-CoV-2*(dE4:E6)	Eq. S125	(SARS-CoV-2/PMMoV)*(dE4:E6)
Eq. S84	SARS-CoV-2*SUVA254	Eq. S126	(SARS-CoV-2/PMMoV)*SUVA254
Eq. S85	SARS-CoV-2*SUVA280	Eq. S127	(SARS-CoV-2/PMMoV)*SUVA280
Eq. S86	SARS-CoV-2*SUVA400	Eq. S128	(SARS-CoV-2/PMMoV)*SUVA400

**Table S3.** Spearman's  $\rho$  correlation coefficients between SARS-CoV-2 N1 and N2 gene concentrations and COVID-19 cases for all five wastewater treatment plants pooled together. Significant Spearman's  $\rho$  correlation coefficients are highlighted in gray. Stars (\*) denote when the difference in Spearman's  $\rho$  between unnormalized and normalized SARS-CoV-2 is significant. Table continues to next page.

Variable	N1				N2			
	Cases	7-Day M. Avg. of Cases	Pop. Norm. Cases	7-Day M. Avg. of Pop. Norm. Cases	Cases	7-Day M. Avg. of Cases	Pop. Norm. Cases	7-Day M. Avg. of Pop. Norm. Cases
SARS-CoV-2	0.54	0.59	0.61	0.69	0.52	0.57	0.60	0.68
SARS-CoV-2/pH	0.56	0.60	0.62	0.69	0.54	0.59	0.61	0.68
SARS-CoV-2/TMIN	0.57	0.61	0.64	0.70	0.56	0.61	0.64	0.70
SARS-CoV-2/TMAX	0.57	0.62	0.64	0.70	0.57	0.62	0.63	0.70
SARS-CoV-2/TAVG	0.55	0.60	0.62	0.69	0.54	0.59	0.63	0.69
SARS-CoV-2/TSS	0.55	0.61	0.60	0.67	0.54	0.59	0.59	0.66
SARS-CoV-2*pH	0.53	0.57	0.61	0.68	0.50	0.55	0.60	0.67
SARS-CoV-2*TMIN	0.58	0.61	0.63	0.68	0.55	0.59	0.61	0.66
SARS-CoV-2*TMAX	0.57	0.61	0.63	0.68	0.55	0.59	0.61	0.66
SARS-CoV-2*TAVG	0.55	0.58	0.61	0.67	0.52	0.56	0.60	0.66
SARS-CoV-2*TSS	0.56	0.58	0.62	0.66	0.56	0.59	0.63	0.68
SARS-CoV-2*Flow	0.66*	0.71*	0.59	0.64	0.64	0.69	0.60	0.66
SARS-CoV-2*Flow/pH	0.66*	0.71*	0.59	0.64	0.64	0.69	0.60	0.66
SARS-CoV-2*Flow/TMIN	0.66*	0.71*	0.62	0.68	0.64	0.70	0.62	0.69
SARS-CoV-2*Flow/TMAX	0.66*	0.71*	0.61	0.68	0.64	0.70	0.62	0.69
SARS-CoV-2*Flow/TAVG	0.65	0.70*	0.59	0.65	0.64	0.69	0.60	0.66
SARS-CoV-2*Flow/TSS	0.62	0.68	0.58	0.65	0.61	0.67	0.58	0.65
SARS-CoV-2*Flow*pH	0.65	0.70*	0.59	0.65	0.63	0.69	0.60	0.66
SARS-CoV-2*Flow*TMIN	0.67*	0.71*	0.61	0.67	0.65	0.70	0.62	0.67
SARS-CoV-2*Flow*TMAX	0.67*	0.71*	0.62	0.67	0.65	0.70	0.62	0.68
SARS-CoV-2*Flow*TAVG	0.66*	0.70*	0.59	0.64	0.64	0.69	0.60	0.66
SARS-CoV-2*Flow*TSS	0.66*	0.70*	0.62	0.66	0.67	0.71	0.63	0.68
(SARS-CoV-2/PMMoV)	0.34*	0.37*	0.43*	0.49*	0.33*	0.36*	0.44*	0.50*
(SARS-CoV-2/PMMoV)/pH	0.34*	0.40*	0.23*	0.27*	0.34*	0.37*	0.44*	0.50*
(SARS-CoV-2/PMMoV)/TMIN	0.35*	0.40*	0.23*	0.26*	0.39	0.42*	0.46*	0.50*
(SARS-CoV-2/PMMoV)/TMAX	0.35*	0.40*	0.23*	0.26*	0.39	0.42*	0.46*	0.50*
(SARS-CoV-2/PMMoV)/TAVG	0.34*	0.40*	0.23*	0.27*	0.35*	0.38*	0.46*	0.51*
(SARS-CoV-2/PMMoV)/TSS	0.34*	0.39*	0.21*	0.25*	0.36*	0.40*	0.42*	0.47*
(SARS-CoV-2/PMMoV)*pH	0.33*	0.36*	0.43*	0.49*	0.328	0.36*	0.44*	0.50*
(SARS-CoV-2/PMMoV)*TMIN	0.38*	0.40*	0.43*	0.46*	0.39	0.41*	0.44*	0.48*
(SARS-CoV-2/PMMoV)*TMAX	0.38*	0.40*	0.43*	0.46*	0.39	0.40*	0.45*	0.48*
(SARS-CoV-2/PMMoV)*TAVG	0.34*	0.36*	0.42*	0.47*	0.34*	0.36*	0.44*	0.49*
(SARS-CoV-2/PMMoV)*TSS	0.38*	0.38*	0.43*	0.45*	0.39	0.40*	0.46*	0.48*
(SARS-CoV-2/PMMoV)*Flow	0.47	0.50	0.43*	0.47*	0.46	0.49	0.45*	0.49*

(SARS-CoV-2/PMMoV)*Flow/pH	0.47	0.50	0.42*	0.47*	0.46	0.49	0.44*	0.49*
(SARS-CoV-2/PMMoV)*Flow/TMIN	0.48	0.51	0.44*	0.48*	0.48	0.51	0.46*	0.50*
(SARS-CoV-2/PMMoV)*Flow/TMAX	0.48	0.51	0.44*	0.48*	0.48	0.51	0.46*	0.50*
(SARS-CoV-2/PMMoV)*Flow/TAVG	0.47	0.50	0.43*	0.48*	0.46	0.50	0.45*	0.50*
(SARS-CoV-2/PMMoV)*Flow/TSS	0.45	0.48	0.41*	0.45*	0.44	0.48	0.42*	0.47*
(SARS-CoV-2/PMMoV)*Flow*pH	0.46	0.49	0.43*	0.47*	0.45	0.49	0.45*	0.50*
(SARS-CoV-2/PMMoV)*Flow*TMIN	0.48	0.49	0.43*	0.46*	0.48	0.50	0.45*	0.48*
(SARS-CoV-2/PMMoV)*Flow*TMAX	0.48	0.49	0.43*	0.46*	0.48	0.50	0.45*	0.48*
(SARS-CoV-2/PMMoV)*Flow*TAVG	0.46	0.48	0.42*	0.46*	0.46	0.49	0.44*	0.49*
(SARS-CoV-2/PMMoV)*Flow*TSS	0.48	0.49	0.44*	0.45*	0.49	0.50	0.46*	0.49*

**Table S4.** Spearman's  $\rho$  correlation coefficients between SARS-CoV-2 N1 and N2 gene concentrations and COVID-19 cases for Beavercreek WRRF. Significant Spearman's  $\rho$  correlation coefficients are highlighted in gray. Stars (\*) denote when the difference in Spearman's  $\rho$  between unnormalized and normalized SARS-CoV-2 is significant. Table continues to next page.

Variable	N1	N2
	7-Day M. Avg. of Cases	7-Day M. Avg. of Cases
SARS-CoV-2	0.74	0.73
SARS-CoV-2/pH	0.74	0.72
SARS-CoV-2/TMIN	0.71	0.72
SARS-CoV-2/TMAX	0.71	0.72
SARS-CoV-2/TAVG	0.71	0.72
SARS-CoV-2/TSS	0.71	0.70
SARS-CoV-2*pH	0.74	0.72
SARS-CoV-2*TMIN	0.76	0.72
SARS-CoV-2*TMAX	0.77	0.72
SARS-CoV-2*TAVG	0.76	0.72
SARS-CoV-2*TSS	0.72	0.71
SARS-CoV-2*Flow	0.73	0.72
SARS-CoV-2*Flow/pH	0.73	0.72
SARS-CoV-2*Flow/TMIN	0.70	0.70
SARS-CoV-2*Flow/TMAX	0.70	0.70
SARS-CoV-2*Flow/TAVG	0.70	0.70
SARS-CoV-2*Flow/TSS	0.69	0.68
SARS-CoV-2*Flow*pH	0.73	0.72
SARS-CoV-2*Flow*TMIN	0.75	0.72
SARS-CoV-2*Flow*TMAX	0.76	0.72
SARS-CoV-2*Flow*TAVG	0.75	0.72
SARS-CoV-2*Flow*TSS	0.72	0.71
(SARS-CoV-2/PMMoV)	0.52*	0.52*
(SARS-CoV-2/PMMoV)/pH	0.52*	0.51*
(SARS-CoV-2/PMMoV)/TMIN	0.51*	0.51*
(SARS-CoV-2/PMMoV)/TMAX	0.51*	0.51*
(SARS-CoV-2/PMMoV)/TAVG	0.51*	0.51*
(SARS-CoV-2/PMMoV)/TSS	0.50*	0.50*
(SARS-CoV-2/PMMoV)*pH	0.53*	0.52*
(SARS-CoV-2/PMMoV)*TMIN	0.53*	0.52*
(SARS-CoV-2/PMMoV)*TMAX	0.54*	0.52*
(SARS-CoV-2/PMMoV)*TAVG	0.54*	0.52*
(SARS-CoV-2/PMMoV)*TSS	0.50*	0.49*
(SARS-CoV-2/PMMoV)*Flow	0.50*	0.50*
(SARS-CoV-2/PMMoV)*Flow/pH	0.50*	0.49*



(SARS-CoV-2/PMMoV)*Flow/TMIN	0.48*	0.49*
(SARS-CoV-2/PMMoV)*Flow/TMAX	0.48*	0.49*
(SARS-CoV-2/PMMoV)*Flow/TAVG	0.48*	0.49*
(SARS-CoV-2/PMMoV)*Flow/TSS	0.47*	0.47*
(SARS-CoV-2/PMMoV)*Flow*pH	0.50*	0.50*
(SARS-CoV-2/PMMoV)*Flow*TMIN	0.51*	0.50*
(SARS-CoV-2/PMMoV)*Flow*TMAX	0.51*	0.50*
(SARS-CoV-2/PMMoV)*Flow*TAVG	0.51*	0.50*
(SARS-CoV-2/PMMoV)*Flow*TSS	0.49*	0.48*

**Table S5.** Spearman's  $\rho$  correlation coefficients between SARS-CoV-2 N1 and N2 gene concentrations and COVID-19 cases for Eaton WTP. Significant Spearman's  $\rho$  correlation coefficients are highlighted in gray. Stars (\*) denote when the difference in Spearman's  $\rho$  between unnormalized and normalized SARS-CoV-2 is significant.

Variable	N1	N2
	7-Day M. Avg. of Cases	7-Day M. Avg. of Cases
SARS-CoV-2	0.51	0.46
SARS-CoV-2/pH	0.54	0.50
SARS-CoV-2/TAVG	0.53	0.52
SARS-CoV-2*pH	0.52	0.47
SARS-CoV-2*TAVG	0.51	0.52
SARS-CoV-2*Flow	0.48	0.43
SARS-CoV-2*Flow/pH	0.47	0.45
SARS-CoV-2*Flow/TAVG	0.48	0.49
SARS-CoV-2*Flow*pH	0.46	0.44
SARS-CoV-2*Flow*TAVG	0.45	0.48
(SARS-CoV-2/PMMoV)	0.55	0.52
(SARS-CoV-2/PMMoV)/pH	0.53	0.51
(SARS-CoV-2/PMMoV)/TAVG	0.53	0.52
(SARS-CoV-2/PMMoV)*pH	0.53	0.50
(SARS-CoV-2/PMMoV)*TAVG	0.52	0.51
(SARS-CoV-2/PMMoV)*Flow	0.52	0.47
(SARS-CoV-2/PMMoV)*Flow/pH	0.51	0.48
(SARS-CoV-2/PMMoV)*Flow/TAVG	0.50	0.52
(SARS-CoV-2/PMMoV)*Flow*pH	0.49	0.45
(SARS-CoV-2/PMMoV)*Flow*TAVG	0.52	0.51

**Table S6.** Spearman's  $\rho$  correlation coefficients between SARS-CoV-2 N1 and N2 gene concentrations and COVID-19 cases for Greenville WTP. Significant Spearman's  $\rho$  correlation coefficients are highlighted in gray. Stars (\*) denote when the difference in Spearman's  $\rho$  between unnormalized and normalized SARS-CoV-2 is significant. Table continues to next page.

Variable	N1	N2
	7-Day M. Avg. of Cases	7-Day M. Avg. of Cases
SARS-CoV-2	0.72	0.69
SARS-CoV-2/pH	0.72	0.68
SARS-CoV-2/TMIN	0.75	0.71
SARS-CoV-2/TMAX	0.74	0.71
SARS-CoV-2/TAVG	0.74	0.71
SARS-CoV-2/TSS	0.74	0.69
SARS-CoV-2*pH	0.72	0.68
SARS-CoV-2*TMIN	0.68	0.65
SARS-CoV-2*TMAX	0.69	0.66
SARS-CoV-2*TAVG	0.69	0.65
SARS-CoV-2*TSS	0.69	0.68
SARS-CoV-2*Flow	0.74	0.69
SARS-CoV-2*Flow/pH	0.74	0.69
SARS-CoV-2*Flow/TMIN	0.75	0.71
SARS-CoV-2*Flow/TMAX	0.75	0.71
SARS-CoV-2*Flow/TAVG	0.75	0.71
SARS-CoV-2*Flow/TSS	0.76	0.69
SARS-CoV-2*Flow*pH	0.74	0.69
SARS-CoV-2*Flow*TMIN	0.72	0.67
SARS-CoV-2*Flow*TMAX	0.72	0.67
SARS-CoV-2*Flow*TAVG	0.72	0.67
SARS-CoV-2*Flow*TSS	0.70	0.67
(SARS-CoV-2/PMMoV)	0.47	0.52
(SARS-CoV-2/PMMoV)/pH	0.47	0.52
(SARS-CoV-2/PMMoV)/TMIN	0.50	0.54
(SARS-CoV-2/PMMoV)/TMAX	0.50	0.54
(SARS-CoV-2/PMMoV)/TAVG	0.50	0.54
(SARS-CoV-2/PMMoV)/TSS	0.51	0.54
(SARS-CoV-2/PMMoV)*pH	0.47	0.52
(SARS-CoV-2/PMMoV)*TMIN	0.45	0.50
(SARS-CoV-2/PMMoV)*TMAX	0.45	0.50
(SARS-CoV-2/PMMoV)*TAVG	0.45	0.50
(SARS-CoV-2/PMMoV)*TSS	0.42	0.49
(SARS-CoV-2/PMMoV)*Flow	0.48	0.53
(SARS-CoV-2/PMMoV)*Flow/pH	0.47	0.52
(SARS-CoV-2/PMMoV)*Flow/TMIN	0.50	0.54

(SARS-CoV-2/PMMoV)*Flow/TMAX	0.50	0.54
(SARS-CoV-2/PMMoV)*Flow/TAVG	0.50	0.55
(SARS-CoV-2/PMMoV)*Flow/TSS	0.52	0.55
(SARS-CoV-2/PMMoV)*Flow*pH	0.48	0.53
(SARS-CoV-2/PMMoV)*Flow*TMIN	0.45	0.50
(SARS-CoV-2/PMMoV)*Flow*TMAX	0.45	0.50
(SARS-CoV-2/PMMoV)*Flow*TAVG	0.45	0.49
(SARS-CoV-2/PMMoV)*Flow*TSS	0.42	0.49

**Table S7.** Spearman's  $\rho$  correlation coefficients between SARS-CoV-2 N1 and N2 gene concentrations and COVID-19 cases for Oxford WRRF. Significant Spearman's  $\rho$  correlation coefficients are highlighted in gray. Stars (\*) denote when the difference in Spearman's  $\rho$  between unnormalized and normalized SARS-CoV-2 is significant. Table continues to next page.

Variable	N1	N2
	7-Day M. Avg. of Cases	7-Day M. Avg. of Cases
SARS-CoV-2	0.63	0.65
SARS-CoV-2/pH	0.61	0.65
SARS-CoV-2/TMIN	0.67	0.70
SARS-CoV-2/TMAX	0.67	0.70
SARS-CoV-2/TAVG	0.67	0.70
SARS-CoV-2/TSS	0.59	0.60
SARS-CoV-2*pH	0.64	0.64
SARS-CoV-2*TMIN	0.55	0.57
SARS-CoV-2*TMAX	0.57	0.58
SARS-CoV-2*TAVG	0.56	0.57
SARS-CoV-2*TSS	0.63	0.67
SARS-CoV-2*Flow	0.66	0.68
SARS-CoV-2*Flow/pH	0.66	0.68
SARS-CoV-2*Flow/TMIN	0.69	0.71
SARS-CoV-2*Flow/TMAX	0.69	0.71
SARS-CoV-2*Flow/TAVG	0.69	0.71
SARS-CoV-2*Flow/TSS	0.62	0.63
SARS-CoV-2*Flow*pH	0.66	0.68
SARS-CoV-2*Flow*TMIN	0.61	0.63
SARS-CoV-2*Flow*TMAX	0.62	0.64
SARS-CoV-2*Flow*TAVG	0.62	0.64
SARS-CoV-2*Flow*TSS	0.67	0.71
(SARS-CoV-2/PMMoV)	0.35*	0.35*
(SARS-CoV-2/PMMoV)/pH	0.35*	0.35*
(SARS-CoV-2/PMMoV)/TMIN	0.39	0.39*
(SARS-CoV-2/PMMoV)/TMAX	0.38*	0.38*
(SARS-CoV-2/PMMoV)/TAVG	0.39	0.38*
(SARS-CoV-2/PMMoV)/TSS	0.32*	0.32*
(SARS-CoV-2/PMMoV)*pH	0.35*	0.35*
(SARS-CoV-2/PMMoV)*TMIN	0.30*	0.32*
(SARS-CoV-2/PMMoV)*TMAX	0.31*	0.32*
(SARS-CoV-2/PMMoV)*TAVG	0.31*	0.32*
(SARS-CoV-2/PMMoV)*TSS	0.36*	0.37*
(SARS-CoV-2/PMMoV)*Flow	0.38*	0.37*
(SARS-CoV-2/PMMoV)*Flow/pH	0.38*	0.37*
(SARS-CoV-2/PMMoV)*Flow/TMIN	0.41	0.40*

(SARS-CoV-2/PMMoV)*Flow/TMAX	0.41	0.40*
(SARS-CoV-2/PMMoV)*Flow/TAVG	0.41	0.40*
(SARS-CoV-2/PMMoV)*Flow/TSS	0.35*	0.34*
(SARS-CoV-2/PMMoV)*Flow*pH	0.38*	0.38*
(SARS-CoV-2/PMMoV)*Flow*TMIN	0.34*	0.34*
(SARS-CoV-2/PMMoV)*Flow*TMAX	0.35*	0.35*
(SARS-CoV-2/PMMoV)*Flow*TAVG	0.35*	0.34*
(SARS-CoV-2/PMMoV)*Flow*TSS	0.40	0.39*

**Table S8.** Spearman's  $\rho$  correlation coefficients between SARS-CoV-2 N1 and N2 gene concentrations and COVID-19 cases for Tri-Cities NR WTP. Significant Spearman's  $\rho$  correlation coefficients are highlighted in gray. Stars (\*) denote when the difference in Spearman's  $\rho$  between unnormalized and normalized SARS-CoV-2 is significant. Table continues to next page.

Variable	N1	N2
	7-Day M. Avg. of Cases	7-Day M. Avg. of Cases
SARS-CoV-2	0.68	0.68
SARS-CoV-2/pH	0.68	0.67
SARS-CoV-2/TMIN	0.67	0.68
SARS-CoV-2/TMAX	0.67	0.68
SARS-CoV-2/TAVG	0.67	0.68
SARS-CoV-2/TSS	0.66	0.66
SARS-CoV-2*pH	0.68	0.67
SARS-CoV-2*TMIN	0.66	0.65
SARS-CoV-2*TMAX	0.66	0.65
SARS-CoV-2*TAVG	0.66	0.65
SARS-CoV-2*TSS	0.66	0.66
SARS-CoV-2*Flow	0.63	0.63
SARS-CoV-2*Flow/pH	0.63	0.63
SARS-CoV-2*Flow/TMIN	0.61	0.63
SARS-CoV-2*Flow/TMAX	0.61	0.63
SARS-CoV-2*Flow/TAVG	0.61	0.63
SARS-CoV-2*Flow/TSS	0.60	0.62
SARS-CoV-2*Flow*pH	0.63	0.63
SARS-CoV-2*Flow*TMIN	0.63	0.63
SARS-CoV-2*Flow*TMAX	0.63	0.63
SARS-CoV-2*Flow*TAVG	0.63	0.63
SARS-CoV-2*Flow*TSS	0.63	0.64
(SARS-CoV-2/PMMoV)	0.46	0.52
(SARS-CoV-2/PMMoV)/pH	-0.07*	0.52
(SARS-CoV-2/PMMoV)/TMIN	-0.09*	0.53
(SARS-CoV-2/PMMoV)/TMAX	-0.09*	0.53
(SARS-CoV-2/PMMoV)/TAVG	-0.09*	0.53
(SARS-CoV-2/PMMoV)/TSS	-0.07*	0.52
(SARS-CoV-2/PMMoV)*pH	0.46	0.52
(SARS-CoV-2/PMMoV)*TMIN	0.45*	0.51
(SARS-CoV-2/PMMoV)*TMAX	0.45*	0.51
(SARS-CoV-2/PMMoV)*TAVG	0.45*	0.51
(SARS-CoV-2/PMMoV)*TSS	0.45*	0.51
(SARS-CoV-2/PMMoV)*Flow	0.43*	0.50
(SARS-CoV-2/PMMoV)*Flow/pH	0.43*	0.50

(SARS-CoV-2/PMMoV)*Flow/TMIN	0.43*	0.49
(SARS-CoV-2/PMMoV)*Flow/TMAX	0.43*	0.49
(SARS-CoV-2/PMMoV)*Flow/TAVG	0.43*	0.49
(SARS-CoV-2/PMMoV)*Flow/TSS	0.42*	0.49
(SARS-CoV-2/PMMoV)*Flow*pH	0.43*	0.50
(SARS-CoV-2/PMMoV)*Flow*TMIN	0.42*	0.49
(SARS-CoV-2/PMMoV)*Flow*TMAX	0.42*	0.49
(SARS-CoV-2/PMMoV)*Flow*TAVG	0.42*	0.49
(SARS-CoV-2/PMMoV)*Flow*TSS	0.43*	0.49



**Table S9.** Spearman's  $\rho$  correlation coefficients between SARS-CoV-2 N1, N2, and E gene concentrations and COVID-19 cases for The Ohio State University on-campus residents. Significant Spearman's  $\rho$  correlation coefficients are highlighted in gray. Stars (\*) denotes significant increase in Spearman's  $\rho$  from unnormalized to normalized SARS-CoV-2. Table continues to next page.

Variable	N1	N2	E
SARS-CoV-2	0.43	0.45	0.43
SARS-CoV-2/Turbidity	0.53	0.38	0.55
SARS-CoV-2/TSS	0.53	0.40	0.53
SARS-CoV-2/DOC	0.43	0.35	0.39
SARS-CoV-2/Total Coliforms	0.35	0.40	0.30
SARS-CoV-2/ <i>E. coli</i>	0.25	0.30	0.32
SARS-CoV-2/Temperature	0.50	0.51	0.50
SARS-CoV-2/pH	0.50	0.51	0.50
SARS-CoV-2/mV_pH	0.18	0.05	0.27
SARS-CoV-2/ORP_mV	0.15	0.07	0.07
SARS-CoV-2/EC	0.55	0.55	0.57
SARS-CoV-2/EC_Abs	0.55	0.55	0.50
SARS-CoV-2/Resistivity	0.43	0.43	0.47
SARS-CoV-2/Pressure	0.50	0.52	0.50
SARS-CoV-2*Turbidity	0.34	0.42	0.31
SARS-CoV-2*TSS	0.27	0.34	0.23
SARS-CoV-2*DOC	0.44	0.40	0.40
SARS-CoV-2*Total Coliforms	0.29	0.38	0.27
SARS-CoV-2* <i>E. coli</i>	0.22	0.16	0.21
SARS-CoV-2*Temperature	0.50	0.55	0.55
SARS-CoV-2*pH	0.50	0.54	0.50
SARS-CoV-2*mV_pH	-0.46	-0.48	-0.38
SARS-CoV-2*ORP_mV	0.32	0.31	0.31
SARS-CoV-2*EC	0.43	0.43	0.47
SARS-CoV-2*EC_Abs	0.43	0.40	0.47
SARS-CoV-2*Resistivity	0.55	0.55	0.57
SARS-CoV-2*Pressure	0.50	0.52	0.50
SARS-CoV-2/(E2:E3)	0.55	0.67	0.63
SARS-CoV-2/(aE2:E4)	0.55	0.67	0.55
SARS-CoV-2/(bE2:E4)	0.55	0.67	0.55
SARS-CoV-2/(cE2:E4)	0.50	0.67	0.55
SARS-CoV-2/(aE4:E6)	0.42	0.45	0.42
SARS-CoV-2/(bE4:E6)	0.53	0.46	0.46
SARS-CoV-2/(cE4:E6)	0.48	0.41	0.47
SARS-CoV-2/(dE4:E6)	0.44	0.47	0.48
SARS-CoV-2/SUVA254	0.63	0.63	0.68
SARS-CoV-2/SUVA280	0.63	0.63	0.77
SARS-CoV-2/SUVA400	0.50	0.45	0.51

SARS-CoV-2*(E2:E3)	0.65	0.70	0.70
SARS-CoV-2*(aE2:E4)	0.65	0.68	0.70
SARS-CoV-2*(bE2:E4)	0.65	0.68	0.70
SARS-CoV-2*(cE2:E4)	0.67	0.75	0.77
SARS-CoV-2*(aE4:E6)	0.42	0.42	0.44
SARS-CoV-2*(bE4:E6)	0.32	0.33	0.36
SARS-CoV-2*(cE4:E6)	0.31	0.41	0.37
SARS-CoV-2*(dE4:E6)	0.35	0.35	0.40
SARS-CoV-2*SUVA254	0.50	0.50	0.52
SARS-CoV-2*SUVA280	0.50	0.50	0.52
SARS-CoV-2*SUVA400	0.27	0.24	0.27

**Table S10.** Spearman's  $\rho$  correlation coefficients between SARS-CoV-2 N1, N2, and E gene concentrations normalized by PMMoV and COVID-19 cases for The Ohio State University on-campus residents. Significant Spearman's  $\rho$  correlation coefficients are highlighted in gray. Stars (\*) denotes significant increase in Spearman's  $\rho$  from unnormalized to normalized SARS-CoV-2. Table continues to next page.

Variable	N1	N2	E
SARS-CoV-2	0.43	0.45	0.43
(SARS-CoV-2/PMMoV)	0.63	0.66	0.62
(SARS-CoV-2/PMMoV)/Turbidity	0.60	0.58	0.62
(SARS-CoV-2/PMMoV)/TSS	0.64	0.65	0.65
(SARS-CoV-2/PMMoV)/DOC	0.52	0.57	0.59
(SARS-CoV-2/PMMoV)/Total Coliforms	0.49	0.35	0.46
(SARS-CoV-2/PMMoV)/ <i>E. coli</i>	0.34	0.23	0.19
(SARS-CoV-2/PMMoV)/Temperature	0.55	0.56	0.58
(SARS-CoV-2/PMMoV)/pH	0.60	0.57	0.63
(SARS-CoV-2/PMMoV)/mV_pH	0.00	0.02	0.06
(SARS-CoV-2/PMMoV)/ORP_mV	0.14	0.08	0.07
(SARS-CoV-2/PMMoV)/EC	0.55	0.57	0.52
(SARS-CoV-2/PMMoV)/EC_Abs	0.55	0.53	0.52
(SARS-CoV-2/PMMoV)/Resistivity	0.59	0.62	0.61
(SARS-CoV-2/PMMoV)/Pressure	0.62	0.57	0.63
(SARS-CoV-2/PMMoV)*Turbidity	0.52	0.60	0.46
(SARS-CoV-2/PMMoV)*TSS	0.50	0.58	0.53
(SARS-CoV-2/PMMoV)*DOC	0.57	0.61	0.51
(SARS-CoV-2/PMMoV)*Total Coliforms	0.47	0.56	0.58
(SARS-CoV-2/PMMoV)* <i>E. coli</i>	0.45	0.39	0.41
(SARS-CoV-2/PMMoV)*Temperature	0.62	0.67	0.63
(SARS-CoV-2/PMMoV)*pH	0.61	0.62	0.63
(SARS-CoV-2/PMMoV)*mV_pH	-0.57	-0.57	-0.44
(SARS-CoV-2/PMMoV)*ORP_mV	0.41	0.41	0.40
(SARS-CoV-2/PMMoV)*EC	0.59	0.62	0.61
(SARS-CoV-2/PMMoV)*EC_Abs	0.59	0.66	0.61
(SARS-CoV-2/PMMoV)*Resistivity	0.55	0.57	0.52
(SARS-CoV-2/PMMoV)*Pressure	0.62	0.57	0.63
(SARS-CoV-2/PMMoV)/(E2:E3)	0.47	0.68	0.62
(SARS-CoV-2/PMMoV)/(aE2:E4)	0.47	0.70	0.60
(SARS-CoV-2/PMMoV)/(bE2:E4)	0.65	0.70	0.68
(SARS-CoV-2/PMMoV)/(cE2:E4)	0.47	0.70	0.55
(SARS-CoV-2/PMMoV)/(aE4:E6)	0.60	0.65	0.61
(SARS-CoV-2/PMMoV)/(bE4:E6)	0.68	0.66	0.63
(SARS-CoV-2/PMMoV)/(cE4:E6)	0.64	0.64	0.65
(SARS-CoV-2/PMMoV)/(dE4:E6)	0.62	0.65	0.64
(SARS-CoV-2/PMMoV)/SUVA254	0.68	0.68	0.75
(SARS-CoV-2/PMMoV)/SUVA280	0.68	0.68	0.75

(SARS-CoV-2/PMMoV)/SUVA400	0.68	0.68	0.61
(SARS-CoV-2/PMMoV)*(E2:E3)	0.70	0.75	0.73
(SARS-CoV-2/PMMoV)*(aE2:E4)	0.70	0.75	0.77
(SARS-CoV-2/PMMoV)*(bE2:E4)	0.62	0.65	0.67
(SARS-CoV-2/PMMoV)*(cE2:E4)	0.77	0.73	0.75
(SARS-CoV-2/PMMoV)*(aE4:E6)	0.64	0.64	0.59
(SARS-CoV-2/PMMoV)*(bE4:E6)	0.57	0.61	0.55
(SARS-CoV-2/PMMoV)*(cE4:E6)	0.62	0.61	0.54
(SARS-CoV-2/PMMoV)*(dE4:E6)	0.62	0.64	0.59
(SARS-CoV-2/PMMoV)*SUVA254	0.67	0.67	0.58
(SARS-CoV-2/PMMoV)*SUVA280	0.65	0.65	0.58
(SARS-CoV-2/PMMoV)*SUVA400	0.55	0.55	0.53