

Supplemental Material

1.1 Sampling Sites

In this study, four university residences were evaluated (Figure S1), each one of the residences contained a meal hall facility, communal washrooms on each floor, and multiple laundry rooms¹⁻³. However, Residence D is unique as it encompasses multiple student services (International Centre, Welcome Centre and Recruitment Office, Admissions Office, and the Student Health and Wellness Centre)⁴. All of the student services contribute to the same sewershed locations as the student housing in Residence D. At each of the residences, grey water and black water exit the buildings via the sanitary sewer lines which are accessed outside of the building nearby. Residence B is sectioned into six houses and contains a complex network of multiple sanitary sewer lines. Residences A, C and D are individual buildings with one accessible sanitary sewer line. All sampling sites are combined sewer systems; however, the proportion of stormwater is unknown. Halifax WWTF was constructed in 2007 and services the Halifax peninsula and surrounding area (Figure S2). The facility has a capacity of 340,000 m³ per day and utilizes an advanced primary treatment process⁵.

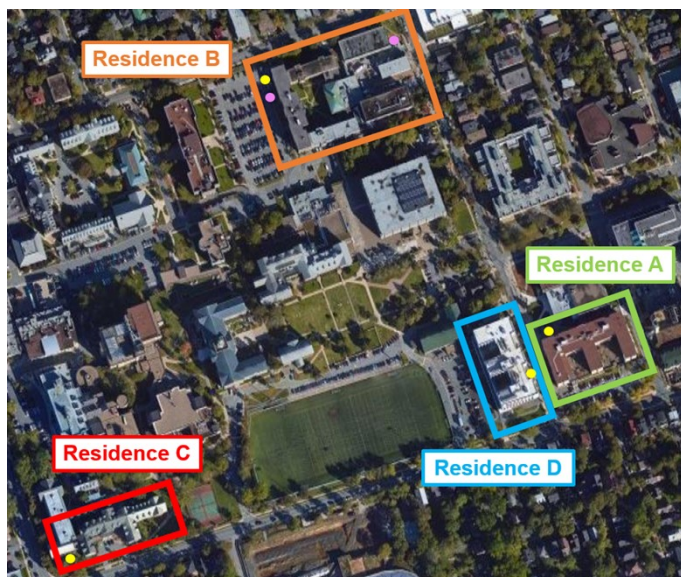


Figure S1. Satellite map of the four university residences. Yellow circles denote the approximate locations of passive sampling sites deployed at the start of the university Fall semester (05 to 15 September 2021). Pink circles denote sampling sites added on 12 December 2021 at Residence B.

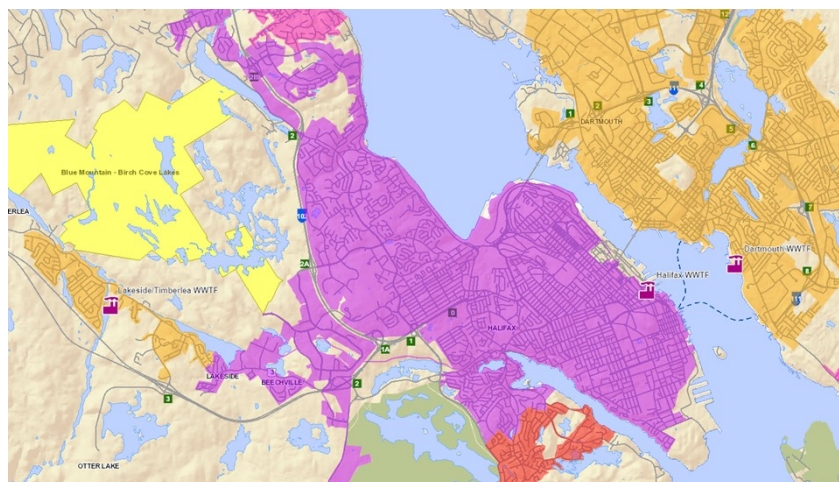


Figure S2. Catchment Area of Halifax, NS WWTF. The map portrays the contributing region (highlighted in purple) for wastewater inflow to the WWTF.

Table S1. Sequences of SARS-CoV-2 Alpha (B.1.1.7), Delta (B.1.617) and Omicron VOC standard reference materials. All controls were stored based on manufacturer's recommendations.

Standards Information		
Alpha (B.1.1.7)	Twist Control 14 Alpha (103907)	GISAID accession EPI_ISL_710528 and assigned to the B.1.1.7 (α) Pango lineage
Delta (B.1.617)	Pos DNA gblock Δ 157-158	TTGTTATTAAGTCTGTGAATTTCAATTTTGTAATGATC CATTTTTGGATGTTTATTACCACA AAAACAACAAAAGTTGGATGGAAAGTGGAGTTTATTCT AGTGCGAATAATTGCACTTTTGA ATATGTCTCTCAGCCTTTTCTTATGGACCTTGAAGGAAA ACAGGGTAATTTCAAAAATCTTAGGG
Omicron (Twist Control 48	GISAID accession ID: EPI_ISL_6841980 and Name: Hong Kong/HKU-211129-001/2021 and assigned the BA.1 Omicron lineage

Table S2. The Minimal Information for Publications on Quantitative Real-Time PCR Experiments (MIQE) checklist of essential and desirable information that should be reported to enable the reviewer to judge the validity of the paper and the reader to repeat the experiment and reproduce the results.

Category	Item	Paper Location	Author Comments	Check
Sample	Type	Methods	Passive and 24	✓

			Composite samples	
	Method of dissection/procurement	Methods and Supplemental	No dissection, synthetic template manufacturers, and sample collection are described	✓
	Processing procedure	Methods	Pre-RNA extraction processing (Sampler elution & Composite centrifugation)	✓
	If frozen, how and how quickly?	Methods	RNA frozen, -80C prior to C28311T analysis	✓
	If fixed, with what and how quickly?	N/A	No fixing performed (i.e., no formalin-fixed procedures)	N/A
	Storage conditions and duration	Methods and Supplemental	Template control storage conditions are described in SI based on manufacturers recommendations.	✓
Extraction	Method or instrument	Methods	Commercial kit (LuminUltra Technologies Ltd).	✓
	Reagents/kits/modifications	Methods		✓
	DNase or RNase treatment	N/A	No specific treatment was completed; purification steps were included in the commercial kit used (LuminUltra Technologies Ltd).	N/A
	Evidence for lack of contamination (DNA or RNA)	Supplemental and Methods	Non-template controls, and Extraction Blanks performed. No amplification observed in any.	✓
	Nucleic acid quantification	Supplemental	RT-qPCR analysis, and multiplex RT-qPCR analysis	✓
	RNA integrity	Supplemental		✓

Reverse transcription	Complete reaction conditions, including all components and their concentrations	Supplemental and Methods		✓
	RNA amount and reaction volume	Methods		✓
	Priming oligo sequence(s)	Supplemental		✓
	Cq values with and without reverse transcriptase	N/A	One-step RT-qPCR was used in this study	N/A
qPCR target	Sequence accession number	Supplemental and Methods	Primer sequences and template sequences used	✓
	Amplicon length	Supplemental and Methods		✓
	<i>In silico</i> specificity (BLAST)	Validated in previous work not performed in this study		✓
	Location by exon/intron	Supplemental		✓
	Identify the splice variants amplified	N/A		×
	All primer/probe sequences	Supplemental		✓
	Location and identity of any oligonucleotide modifications	Supplemental		✓
	Complete reaction conditions, including all components and their concentrations	Methods & Supplemental		✓
qPCR protocol	cDNA/DNA amount and reaction volume	Methods		✓
	Instrument identification and complete thermocycling parameters	Methods & Supplemental		✓
	Evidence for PCR specificity (gels, sequencing, or melting)	Validated by other researchers not in this study		×

	curves)			
qPCR validation	Template inhibition data (template titrations)	Supplemental	Extract dilutions were evaluated for inhibition, no inhibition was expected.	✓
	For SYBR Green I reactions, the C _q of the no template control	Methods	Didn't include data where no template control failed	✓
	Calibration curves with slope and intercept	Methods		✓
	PCR efficiency from the slope	Methods		✓
	r ² of the calibration curve	Methods		✓
	Evidence for the linear dynamic range	Methods		✓
	Evidence for the limit of detection	Validated in previous publications – cited in methods		✓
	For multiplexed assays, the efficiency and limit of detection of each assay		Multiplex assay not used	N/A
	qPCR analysis method/software	Methods		✓
Data analysis	Method of C _q determination	Methods		✓
	Results of no template controls	Methods		✓
	Justification of number and choice of reference genes	Supplemental and methods		✓
	Normalization method	No normalization periods		×
	Number and stage (reverse transcription or qPCR) of technical replicates	Supplemental and Methods		✓
	Intra-assay variation in	Not performed		×

	terms of concentration, not Cq			
	Statistical methods/software	Methods		✓

Table S3. Positive RT-qPCR detections observed at all sample locations and sampling dates for C2831TT and N2 targets.

location type	sample date	GC/mL	target	location type	sample date	GC/mL	target
Residence A	2021-10-04	907.5	n2	WWTF	2021-11-26	76320.2	C28311T
Residence A	2021-10-04	1188.3	n2	WWTF	2021-11-26	64515.8	C28311T
Residence A	2021-10-08	35.5	n2	WWTF	2021-11-29	68538.8	C28311T
Residence A	2021-10-08	112.3	n2	WWTF	2021-11-29	61550.7	C28311T
Residence A	2021-10-11	48718.3	n2	WWTF	2021-12-10	0.9	C28311T
Residence A	2021-10-11	38741.4	n2	WWTF	2021-12-15	90893.3	C28311T
Residence A	2021-10-15	116217.5	n2	WWTF	2021-12-15	1248.1	C28311T
Residence A	2021-10-15	115436.9	n2	WWTF	2021-12-17	50311.2	C28311T
Residence A	2021-10-18	266249.6	n2	WWTF	2021-12-17	84985	C28311T
Residence A	2021-10-18	220462	n2	WWTF	2021-12-22	455.4	C28311T
Residence A	2021-10-20	160607.6	n2	WWTF	2021-12-22	414.5	C28311T
Residence A	2021-10-20	250579.9	n2	WWTF	2021-12-24	1611.3	C28311T
Residence A	2021-10-29	1351105.6	n2	WWTF	2021-12-24	420.1	C28311T
Residence A	2021-10-29	117794.6	n2	WWTF	2021-12-27	1971.2	C28311T
Residence A	2021-11-05	2632.2	n2	WWTF	2021-12-27	2254.8	C28311T
Residence A	2021-11-05	1066.8	n2	WWTF	2021-12-29	288.3	C28311T
Residence A	2021-12-02	134.7	n2	WWTF	2021-12-29	431.6	C28311T
Residence A	2021-12-02	280.9	n2	WWTF	2021-12-31	101.1	C28311T
Residence A	2021-12-08	271.6	n2	WWTF	2021-12-31	1506.5	C28311T
Residence A	2021-12-08	114.6	n2	Residence A	2021-11-05	39.7	C28311T
Residence A	2021-12-10	109.3	n2	Residence A	2021-11-05	70.2	C28311T
Residence A	2021-12-10	132.9	n2	Residence A	2021-12-02	1598.9	C28311T
Residence A	2021-12-11	1288.4	n2	Residence A	2021-12-02	301.9	C28311T
Residence A	2021-12-11	438.3	n2	Residence A	2021-12-08	199	C28311T
Residence A	2021-12-12	70.1	n2	Residence A	2021-12-08	483.3	C28311T
Residence A	2021-12-12	52.4	n2	Residence A	2021-12-10	538.2	C28311T
Residence A	2021-12-13	2333145	n2	Residence A	2021-12-10	200.4	C28311T
Residence A	2021-12-13	2137940	n2	Residence A	2021-12-11	18094.5	C28311T
Residence A	2021-12-14	1212.6	n2	Residence A	2021-12-11	14205.8	C28311T
Residence A	2021-12-14	1229	n2	Residence A	2021-12-12	411.3	C28311T
Residence A	2021-12-15	87.5	n2	Residence A	2021-12-12	271.1	C28311T
Residence A	2021-12-15	22	n2	Residence A	2021-12-13	2333145	C28311T
Residence A	2021-12-16	284.7	n2	Residence A	2021-12-13	2137940	C28311T

Residence A	2021-12-16	304.6	n2	Residence A	2021-12-14	3243171	C28311T
Residence A	2021-12-17	370433.9	n2	Residence A	2021-12-14	3331545	C28311T
Residence A	2021-12-17	24008.2	n2	Residence A	2021-12-15	181444.6	C28311T
Residence A	2021-12-18	22595.3	n2	Residence A	2021-12-15	176631.6	C28311T
Residence A	2021-12-18	23686.8	n2	Residence A	2021-12-16	2301992	C28311T
Residence A	2021-12-19	1415.9	n2	Residence A	2021-12-16	3515581	C28311T
Residence A	2021-12-19	315	n2	Residence A	2021-12-17	310641.5	C28311T
Residence A	2021-12-20	363019.3	n2	Residence A	2021-12-17	144377.7	C28311T
Residence A	2021-12-20	609967.4	n2	Residence A	2021-12-18	434716.9	C28311T
Residence A	2021-12-21	938929.1	n2	Residence A	2021-12-18	3178433	C28311T
Residence A	2021-12-21	1111238.1	n2	Residence A	2021-12-19	503991.5	C28311T
Residence A	2021-12-22	111611.7	n2	Residence A	2021-12-19	1248764	C28311T
Residence A	2021-12-22	206093.4	n2	Residence A	2021-12-20	#####	C28311T
Residence B	2021-10-16	6900.3	n2	Residence A	2021-12-20	#	C28311T
Residence B	2021-10-16	7686	n2	Residence A	2021-12-20	3709785	C28311T
Residence B	2021-11-06	32.1	n2	Residence A	2021-12-21	#####	C28311T
Residence B	2021-11-06	61.7	n2	Residence A	2021-12-21	#	C28311T
Residence B	2021-11-12	48	n2	Residence A	2021-12-21	6266515	C28311T
Residence B	2021-11-12	33.4	n2	Residence A	2021-12-22	27264.8	C28311T
Residence B	2021-11-13	253.9	n2	Residence A	2021-12-22	539029.6	C28311T
Residence B	2021-11-13	89.3	n2	Residence B	2021-11-06	855.8	C28311T
Residence B	2021-11-14	31.6	n2	Residence B	2021-11-06	142.2	C28311T
Residence B	2021-11-14	99.5	n2	Residence B	2021-11-12	32	C28311T
Residence B	2021-11-16	25	n2	Residence B	2021-11-12	8.9	C28311T
Residence B	2021-11-16	142.2	n2	Residence B	2021-11-13	38.4	C28311T
Residence B	2021-11-17	103.6	n2	Residence B	2021-11-13	5469.9	C28311T
Residence B	2021-11-17	79.1	n2	Residence B	2021-11-14	354.8	C28311T
Residence B	2021-11-18	248.8	n2	Residence B	2021-11-14	116.3	C28311T
Residence B	2021-11-18	341.5	n2	Residence B	2021-11-16	88.3	C28311T
Residence B	2021-11-20	154.2	n2	Residence B	2021-11-16	83.1	C28311T
Residence B	2021-11-20	182.5	n2	Residence B	2021-11-17	455658.1	C28311T
Residence B	2021-11-26	945	n2	Residence B	2021-11-17	10.2	C28311T
Residence B	2021-11-26	570	n2	Residence B	2021-11-18	845632.5	C28311T
Residence B	2021-11-27	60.4	n2	Residence B	2021-11-18	510812	C28311T
Residence B	2021-11-27	107.9	n2	Residence B	2021-11-20	81.4	C28311T
Residence B	2021-11-28	51.4	n2	Residence B	2021-11-20	1019.2	C28311T
Residence B	2021-11-28	77.5	n2	Residence B	2021-11-26	636.7	C28311T
Residence B	2021-12-12	284812.3	n2	Residence B	2021-11-26	2178.1	C28311T
Residence B	2021-12-12	262684.9	n2	Residence B	2021-11-27	240.3	C28311T
Residence B	2021-12-13	131207	n2	Residence B	2021-11-27	455658.1	C28311T
Residence B	2021-12-13	115436.9	n2	Residence B	2021-11-28	350590.7	C28311T
Residence B	2021-12-14	674856.1	n2	Residence B	2021-11-28	455658.1	C28311T
Residence B	2021-12-14	1103774	n2	Residence B	2021-12-12	535418.9	C28311T
				Residence B	2021-12-12	487336	C28311T
				Residence B	2021-12-13	739269.6	C28311T

Residence B	2021-12-15	1351105.6	n2	Residence B	2021-12-13	2873617	C28311T
Residence B	2021-12-15	1118752.7	n2	Residence B	2021-12-14	2615554	C28311T
Residence B	2021-12-16	298571	n2	Residence B	2021-12-14	2971828	C28311T
Residence B	2021-12-16	150140	n2	Residence B	2021-12-15	2991869	C28311T
Residence B	2021-12-17	1133934.7	n2	Residence B	2021-12-15	468074.4	C28311T
Residence B	2021-12-17	111611.7	n2	Residence B	2021-12-16	183.6	C28311T
Residence B	2021-12-18	204709.1	n2	Residence B	2021-12-16	4381.8	C28311T
Residence B	2021-12-18	1004390.4	n2	Residence B	2021-12-17	616582.8	C28311T
Residence B	2021-12-19	1769164.4	n2	Residence B	2021-12-17	572641.8	C28311T
Residence B	2021-12-19	330333.1	n2	Residence B	2021-12-18	207.2	C28311T
Residence B	2021-12-21	55748.3	n2	Residence B	2021-12-18	207550.1	C28311T
Residence B	2021-12-21	85237.5	n2	Residence B	2021-12-19	9177.7	C28311T
Residence B	2021-12-20	4247.4	n2	Residence B	2021-12-19	43061.7	C28311T
Residence B	2021-12-20	13267.4	n2	Residence B	2021-12-20	74721.2	C28311T
Residence B	2021-12-22	29387.9	n2	Residence B	2021-12-20	29357	C28311T
Residence B	2021-12-22	36657.1	n2	Residence B	2021-12-21	113349.2	C28311T
WWTF	2021-10-04	0.1	n2	Residence B	2021-12-21	2686826	C28311T
WWTF	2021-10-04	6.8	n2	Residence B	2021-12-22	637655.5	C28311T
WWTF	2021-10-08	198.7	n2	Residence B	2021-12-22	1248764	C28311T
WWTF	2021-10-08	187	n2				
WWTF	2021-10-11	111.3	n2				
WWTF	2021-10-11	123.2	n2				
WWTF	2021-10-15	263.8	n2				
WWTF	2021-10-15	374.5	n2				
WWTF	2021-10-18	32	n2				
WWTF	2021-10-18	1	n2				
WWTF	2021-10-20	497	n2				
WWTF	2021-10-20	130.9	n2				
WWTF	2021-10-29	3.4	n2				
WWTF	2021-10-29	8.3	n2				
WWTF	2021-11-03	0.6	n2				
WWTF	2021-11-03	1.3	n2				
WWTF	2021-11-08	1	n2				
WWTF	2021-11-08	0.7	n2				
WWTF	2021-11-22	2.3	n2				
WWTF	2021-11-22	0.2	n2				
WWTF	2021-11-26	1.7	n2				
WWTF	2021-11-26	0.4	n2				
WWTF	2021-11-29	2.8	n2				
WWTF	2021-11-29	1.8	n2				
WWTF	2021-12-10	3.1	n2				
WWTF	2021-12-10	1.8	n2				
WWTF	2021-12-15	6.8	n2				
WWTF	2021-12-15	17.4	n2				

WWTF	2021-12-17	362.1	n2
WWTF	2021-12-17	995	n2
WWTF	2021-12-22	63.6	n2
WWTF	2021-12-22	73.3	n2
WWTF	2021-12-24	734.7	n2
WWTF	2021-12-24	549.9	n2
WWTF	2021-12-27	284.1	n2
WWTF	2021-12-27	362.1	n2
WWTF	2021-12-29	106.2	n2
WWTF	2021-12-29	172.5	n2
WWTF	2021-12-31	113.6	n2
WWTF	2021-12-31	172.5	n2
Residence C	2021-12-08	332.5	n2
Residence C	2021-12-08	2562.2	n2
Residence C	2021-12-16	266249.6	n2
Residence C	2021-12-16	113126.3	n2
Residence C	2021-12-17	38741.4	n2
Residence C	2021-12-17	48718.3	n2
Residence C	2021-12-18	43738.2	n2
Residence C	2021-12-18	53901	n2
Residence C	2021-12-19	1435595	n2
Residence C	2021-12-19	1141603	n2
Residence D	2021-10-18	85.2	n2
Residence D	2021-10-18	3.4	n2

1.2 References

1. Dalhousie University. Howe Hall. *Residence*
https://www.dal.ca/campus_life/residence_housing/residence/halifax-campus/res-buildings-halifax/howe-hall.html.
2. Dalhousie University. Risley Hall. *Residence*
https://www.dal.ca/campus_life/residence_housing/residence/halifax-campus/res-buildings-halifax/risley-hall.html.
3. Dalhousie University. Shirreff Hall. *Residence*
https://www.dal.ca/campus_life/residence_housing/residence/halifax-campus/res-buildings-halifax/shirreff-hall.html.
4. Dalhousie University. LeMarchant Place. *Residence*
https://www.dal.ca/campus_life/residence_housing/residence/halifax-campus/res-buildings-halifax/lemarchant-place.html.
5. Halifax Water. Service Information. *Where Does My Wastewater Go?*
<https://hwc.maps.arcgis.com/apps/InformationLookup/index.html?appid=fe494ffcd144087a142dce3703afa8b>.

6. Graber, T. E. *et al.* Near real-time determination of B.1.1.7 in proportion to total SARS-CoV-2 viral load in wastewater using an allele-specific primer extension PCR strategy. *Water Research* **205**, 117681 (2021).
7. Yaniv, K., Ozer, E. & Kushmaro, A. *SARS-CoV-2 Variants of Concern, Gamma (P.1) and Delta (B.1.617), Sensitive Detection and Quantification in Wastewater Employing Direct RT-qPCR.* <http://medrxiv.org/lookup/doi/10.1101/2021.07.14.21260495> (2021)
doi:10.1101/2021.07.14.21260495.
8. Canada, P. H. A. of. COVID-19 daily epidemiology update. *aem* <https://health-infobase.canada.ca/covid-19/epidemiological-summary-covid-19-cases.html#VOC> (2020).
9. Ahmed, W. *et al.* Detection of the Omicron (B.1.1.529) variant of SARS-CoV-2 in aircraft wastewater. *Science of The Total Environment* 153171 (2022)
doi:10.1016/j.scitotenv.2022.153171.