

1

Support Information

2

3

Unraveling the Impact of COVID-19 Lockdowns on Canadian Municipal Sewage

4

Pengxiao Zhou^a, Zhong Li^{a,*}, Spencer Snowling^b, and Jacob Barclay^b

5

6 ^a *Department of Civil Engineering, McMaster University, Hamilton, Ontario, Canada, L8S 4L8*

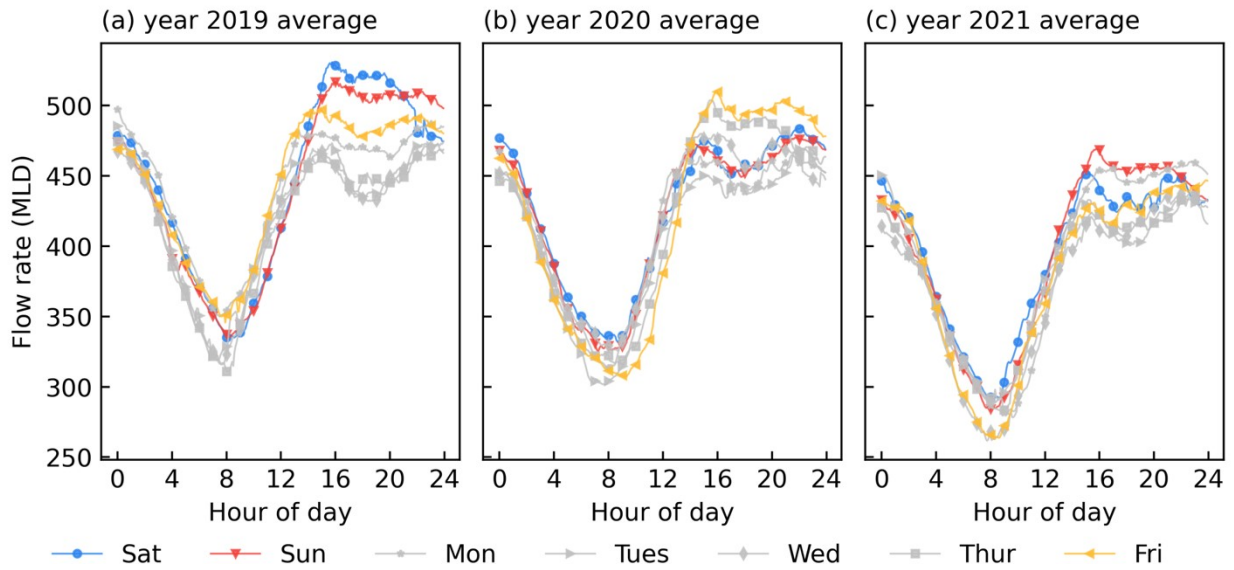
7 ^b *Hatch Ltd., Sheridan Science & Technology Park, 2800 Speakman Drive, Mississauga, Ontario,*
8 *Canada, L5K 2R7*

9 * *Corresponding author. Email address: zoeli@mcmaster.ca*

10 **Development of the No-lockdown Scenario**

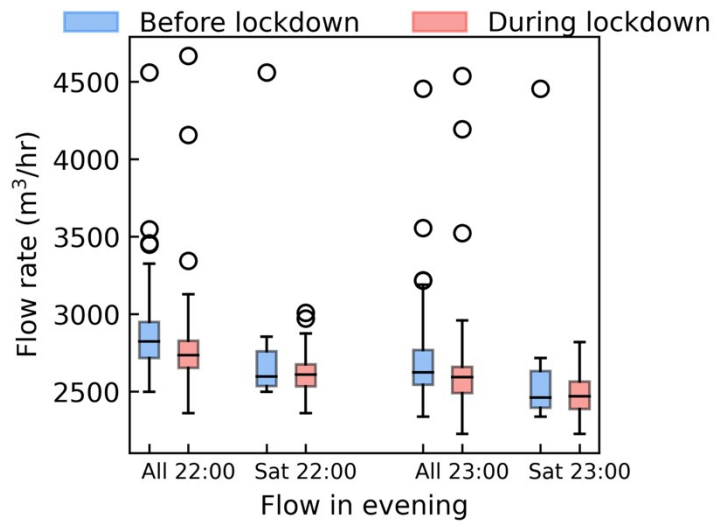
11 Predictions of influent flow rate under the no-lockdown scenario were generated by random
12 forest (RF) models. The predictor variables included precipitation, snow depth, air temperature,
13 humidity, pressure, wind direction, wind speed, hour of day, day of the week, and month of year.
14 The target variable was the hourly influent flow rate at the current time step. The collected data
15 for Plant A was sequentially split into a training set (from November 1, 2016 to December 31,
16 2019) and a testing set (from January 1, 2020 to August 3, 2021), while that for Plant B was also
17 sequentially split into a training set (from January 1, 2019 to December 31, 2019) and a testing set
18 (from January 1, 2020 to November 30, 2021). The random forest model for each plant was trained
19 on the training set. The predictions made on the testing sets were regarded as no-lockdown scenario
20 influent flow rates. The models were implemented using the scikit-learn library in Python.¹ To
21 improve the models' performance, hyperparameter tuning was performed using cross-validation
22 on the training set. The hyperparameters that were tuned included the maximum depth of each tree.
23 Root mean square error (RMSE) defined in scikit-learn library was used as a criterion to evaluate
24 the models' performance (Figure S2).

25 Figure S1. Weekly pattern of Plant B: (a) year 2019 average before lockdowns, (b) year 2020
26 average mostly during lockdowns, (c) year 2021 average during lockdowns.



27
28
29
30
31
32
33
34
35
36
37
38
39
40

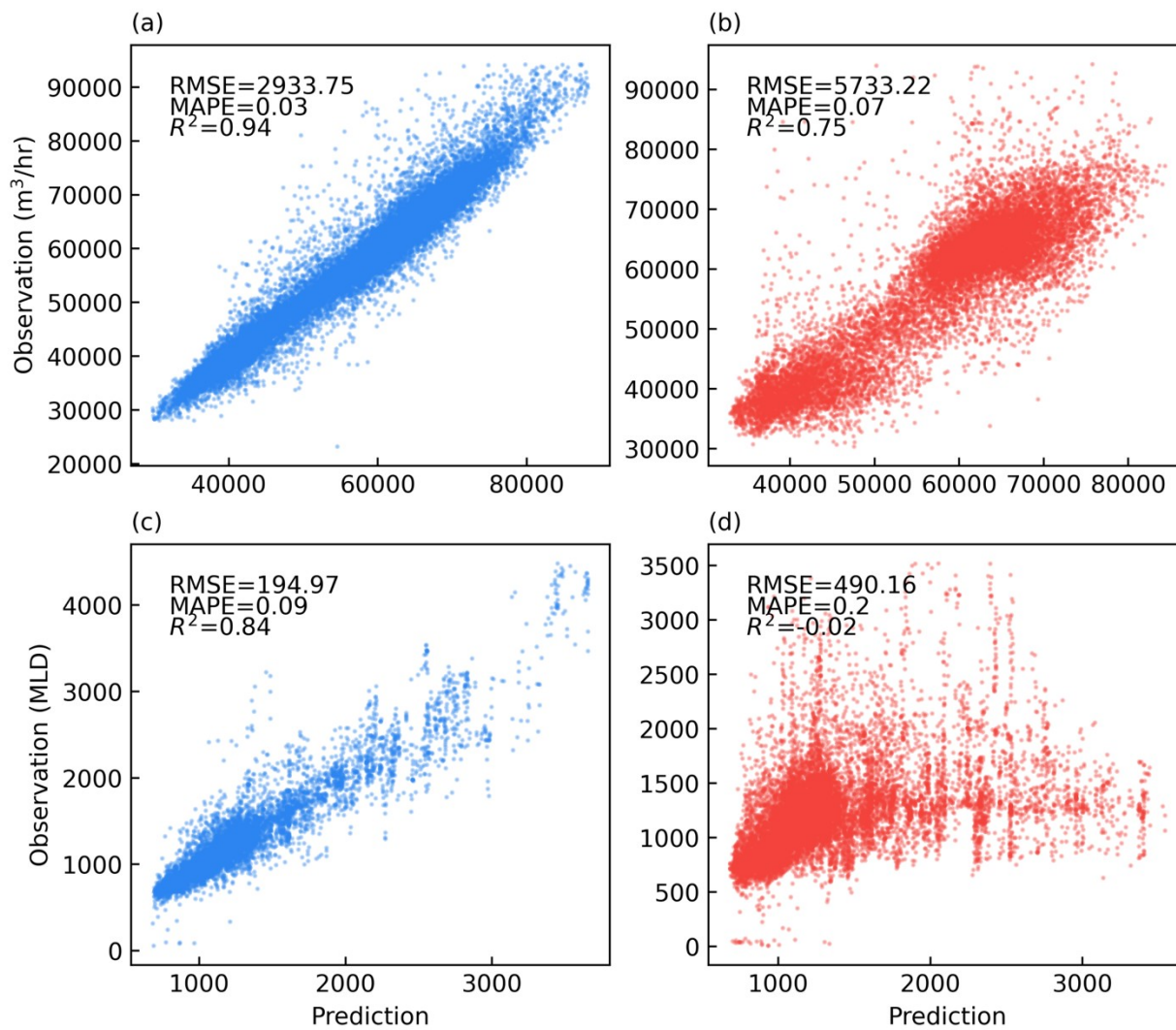
41 Figure S2. Comparison of influent flow rate in evening.



42

43

44 Figure S3. Scatter plots of RF models: (a) predictions made on training set for Plant A, (b)
45 predictions made on testing set for Plant A, (c) predictions made on training set for Plant B, (d)
46 predictions made on testing set for Plant B.



47

48

49 **Reference**

- 50 (1) Pedregosa, F.; Varoquaux, G.; Gramfort, A.; Michel, V.; Thirion, B.; Grisel, O.; Blondel, M.;
51 Prettenhofer, P.; Weiss, R.; Dubourg, V. Scikit-Learn: Machine Learning in Python. *the*
52 *Journal of machine Learning research* **2011**, *12*, 2825–2830.

53