**Supplemental Materials -** **POU Water Filters Effectively Reduce Lead in Drinking Water: A Demonstration Field Study in Flint, Michigan**

Data Analysis Notes

The analysis presented in this paper includes 345 distinct sampling events at 342 distinct sampling locations. The summary statistics differ slightly from the raw data posted on EPA’s website (see <https://www.epa.gov/flint/flint-water-sampling-objectives#FilterEfficacy>) for several reasons. Some types of faucets did not allow the installation of a faucet-mounted POU filter, and some residents did not want a filter installed. Results from the 123 sampling locations where only an unfiltered grab sample was collected at that faucet were not included in the subsequent analysis because there was no filtered water sample for comparison. In addition, results from sampling locations with filter types other than the Brita® and PUR® POU filters being distributed in Flint (e.g., point-of-entry, under sink, and faucet-mounted POUs known to be not certified for lead removal under NSF-53) were not included in the subsequent analysis.

Lead levels in filtered water, existing filter samples collected from the same taps were statistically lower than unfiltered water (student’s t-test two-sample, assuming unequal variances, double-tailed p-value of 0.0051, see Table S1).

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| **Table S1: Student’s t-Test: Two-Sample Assuming Unequal Variances, comparing lead levels in Unfiltered and Filtered water samples from the same sampling locations, with 0.5 ppb reporting limit as "floor"** | | |
|  | *Maximum Unfiltered Lead by site (0.5 ppb as floor)* | *Maximum Filtered Lead by site (0.5 ppb as floor)* |
| Mean | 35.7 | 0.532 |
| Variance | 53800 | 0.0518 |
| Observations | 345 | 345 |
| Hypothesized Mean Difference | 0 |  |
| df | 344 |  |
| t Stat | 2.82 |  |
| P(T<=t) one-tail | 0.00257 |  |
| t Critical one-tail | 1.65 |  |
| P(T<=t) two-tail | 0.00515 |  |
| t Critical two-tail | 1.97 |  |

As noted in the article, most samples did not have an intentional stagnation period before the sampling. Despite higher lead in unfiltered water samples following stagnation (median 6.0 µg/L and 90th Percentile 140 µg/L), compared to the overall dataset (median 3.1 µg/L and 90th Percentile 57 µg/L), the stagnation period did not affect the corresponding filtered water samples. Lead levels in most filtered water samples were below the reporting limit of 0.5 µg/L: 97% of the overall filtered sample dataset and 99% of the filtered samples corresponding to a stagnated unfiltered sample. Figure S1 presents the distribution of lead results for the subset of samples with a known stagnation time of 6 hours or more prior to the unfiltered water sample. Note that Figure S1 shows a similar distribution for the filtered water samples compared to Figure 3 that presents the full data set (with and without stagnation).

**Figure S1. Percentile versus concentration distribution of lead levels in filtered and unfiltered drinking water samples, for the subset of samples with a known stagnation time of 6 hours or more prior to the unfiltered water sample.** Note logarithmic scale for lead concentration. Laboratory results presented include some estimated values between the Method Detection Limit (0.11 µg/L) and the Reporting Limit (0.5 µg/L).

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| **Table S2. Method Detection Limits and Reporting Limits (RL) for Filtered and Unfiltered Water Samples** | | | | | | | | |
| Analyte | Method Detection Limit (range) | Reporting Limit (range) | Total Number of Included Samples (Filtered and Unfiltered Water) | % Detects (all samples) | % above highest RL (all samples) | Total Number of Included Unfiltered Water Samples | % Detects (Unfiltered Water Samples) | % Above Highest RL (Unfiltered Water Samples) |
| Copper | 0.07 to 0.75 µg/L | 1 to 5 µg/L | 845 | 48% | 40% | 353 | 98% | 93% |
| Lead | 0.012 to 0.11 µg/L | 0.5 µg/L | 845 | 50% | 35% | 353 | 93% | 80% |
| Zinc | 0.69 to 12 µg/L | 10 to 50 µg/L | 845 | 43% | 22% | 353 | 87% | 49% |
| Iron | 10 to 16 µg/L | 80 to 100 µg/L | 845 | 39% | 18% | 353 | 84% | 41% |
| Manganese | 0.5 to 1.6 µg/L | 5 to 15 µg/L | 845 | 54% | 7% | 353 | 75% | 14% |
| Aluminum | 9 to 27 µg/L | 100 to 200 µg/L | 845 | 47% | 4% | 353 | 83% | 10% |
| Nickel | 0.046 to 1.8 µg/L | 1 to 40 µg/L | 845 | 53% | 1% | 353 | 78% | 0% |
| Cadmium | 0.061 to 0.21 µg/L | 0.5 to 2 µg/L | 845 | 29% | 1% | 353 | 42% | 3% |
| Chromium | 0.2 to 1.1 µg/L | 5 µg/L | 845 | 23% | 0.4% | 353 | 41% | 1% |

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| --- | --- | --- | --- | --- | --- | --- |
| **Table S3. Summary of Metals Results for Filtered and Unfiltered Water Samples, parts per billion (**µg/L**). Count = 353 unfiltered water samples, 260 new filter samples, and 232 existing filter samples.** | | | | | | |
| Analyte | Sample Type | **Maximum** | **90th Percentile** | **Median** | **10th Percentile** | **Minimum** |
| Aluminum | Unfiltered Water | **4,190** | <200 | <200 (38) | <200 (15) | <200 (<9) |
| Filtered Water - New Filter | <200 | <200 | <200 (<9) | <200 (<9) | <200 (<9) |
| Filtered Water – Existing Filter | **330** | <200 (<100) | <200 (<9) | <200 (<9) | <200 (<9) |
| Cadmium | Unfiltered Water | **12** | <2 | <2 (0.11) | <2 (<0.061) | <2 (<0.061) |
| Filtered Water - New Filter | <2 | <2 | <2 (<0.061) | <2 (<0.061) | <2 (<0.061) |
| Filtered Water – Existing Filter | <2 | <2 (0.554) | <2 (<0.061) | <2 (<0.061) | <2 (<0.061) |
| Chromium | Unfiltered Water | **9.6** | <5 | <5 (0.22) | <5 (<0.2) | <5 (<0.2) |
| Filtered Water - New Filter | <5 | <5 | <5 (<0.2) | <5 (<0.2) | <5 (<0.2) |
| Filtered Water – Existing Filter | <5 | <5 | <5 (<0.2) | <5 (<0.2) | <5 (<0.2) |
| Copper | Unfiltered Water | **4,700** | **268** | **37** | **6.80** | <5 (<0.75) |
| Filtered Water - New Filter | **18** | <5 (<1) | <5 (<0.75) | <5 (<0.75) | <5 (<0.75) |
| Filtered Water – Existing Filter | **120** | <5 (1.3) | <5 (<0.75) | <5 (<0.75) | <5 (<0.75) |
| Iron | Unfiltered Water | **110,000** | **591** | <100 (80) | <100 (19) | <100 (<16) |
| Filtered Water - New Filter | <100 | <100 (<80) | <100 (<16) | <100 (<16) | <100 (<16) |
| Filtered Water – Existing Filter | **880** | <100 (<80) | <100 (<16) | <100 (<16) | <100 (<16) |
| Lead | Unfiltered Water | **4,080** | **57.2** | **3.05** | <0.5 (0.208) | <0.5 (<0.11) |
| Filtered Water - New Filter | **1.01** | <0.5 | <0.5 (<0.11) | <0.5 (<0.11) | <0.5 (<0.11) |
| Filtered Water – Existing Filter | **2.9** | <0.5 | <0.5 (<0.11) | <0.5 (<0.11) | <0.5 (<0.11) |
| Manganese | Unfiltered Water | **4,020** | **23** | <15 (4.2) | <15 (<1.1) | <15 (<1.1) |
| Filtered Water - New Filter | **190** | <15 (<8) | <15 (1.35) | <15 (<1.1) | <15 (<1.1) |
| Filtered Water – Existing Filter | **68** | <15 (<8) | <15 (1.2) | <15 (<1.1) | <15 (<1.1) |
| Nickel | Unfiltered Water | **180** | <40 (<6) | <40 (0.90) | <40 (0.33) | <40 (<0.23) |
| Filtered Water - New Filter | <40 (14.3) | <40 (<6) | <40 (<0.23) | <40 (<0.23) | <40 (<0.23) |
| Filtered Water – Existing Filter | <40 (11.6) | <40 (2.72) | <40 (0.30) | <40 (<0.23) | <40 (<0.23) |
| Zinc | Unfiltered Water | **13,000** | **370** | <50 (48) | <50 (<7.3) | <50 (<7.3) |
| Filtered Water - New Filter | **37** | <50 (<10) | <50 (<7.3) | <50 (<7.3) | <50 (<7.3) |
| Filtered Water – Existing Filter | **540** | <50 (22) | <50 (<7.3) | <50 (<7.3) | <50 (<7.3) |
| Note: Laboratory results included some estimated values between the Method Detection Limit and the Reporting Limit. This table shows values below the Reporting Limit in parentheses. | | | | | | |

**Table S4: Metals levels in 9 drinking water particulate samples collected in Flint, Michigan. Particulate samples contained high levels of lead, with up to 97,000 ppm (9.7% by mass), wet basis, in one solid sample.**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Particulate Sample Type and Units** | **Sampling Location** | **Al** | **Cd** | **Ca** | **Cr** | **Cu** | **Fe** | **Pb** | **Mg** | **Mn** | **Ni** | **K** | **Na** | **Zn** |
| **ppb, wet basis (as slurry)** | FGW-dk | 3100 | 6.6 | 43000 | 9.2 | 4400 | 17000 | 1400 | 9200 | 130 | 2700 | 4800 | 7300 | 29000 |
| FGW-be | 6600 | 2 | 31000 | 17 | 10000 | 1500 | 160000 | 20000 | 190 | 570 | 4400 | 12000 | 10000 |
| FGW-db | 4700 | 21 | 100000 | 4.5 | 4400 | 9600 | 1300 | 18000 | 120 | 6400 | 1400 | 7200 | 58000 |
| **Average** | **9600** | **14** | **52000** | **13** | **5400** | **24000** | **44000** | **14000** | **3400** | **2400** | **3000** | **7700** | **28000** |
| **Maximum** | **24000** | **27** | **100000** | **21** | **10000** | **69000** | **160000** | **20000** | **13000** | **6400** | **4800** | **12000** | **58000** |
| **Minimum** | **3100** | **2** | **31000** | **4.5** | **2900** | **1500** | **1300** | **9200** | **120** | **53** | **1400** | **4300** | **10000** |
| **ppm, wet basis (as solid)** | R-k | 1600 | 7.6 | 2100 | 8.4 | 75000 | 230000 | 97000 | 2800 | 490 | 38 | 44 | 60 | 34000 |
| S-bf | 13000 | 17 | 4000 | 8.2 | 15000 | 2700 | 660 | 21000 | 160 | 320 | 170 | 260 | 15000 |
| FG-as | 190 | 22 | 6700 | 18 | 460000 | 1500 | 23000 | 1200 | 36 | 470 | 1500 | 2600 | 220000 |
| Grab-kp | 1000 | 0.21 | 28000 | 2.5 | 2000 | 76 | 62 | 840 | 3.4 | 640 | 840 | 290 | 9400 |
| Grab-km | 180 | 1.2 | 84000 | 260 | 940 | 1300 | 22 | 16000 | 76 | 3500 | 19000 | 120000 | 2300 |
| **Average** | **3200** | **9.6** | **25000** | **59** | **110000** | **47000** | **24000** | **8400** | **150** | **990** | **4300** | **25000** | **56000** |
| **Maximum** | **13000** | **22** | **84000** | **260** | **460000** | **230000** | **97000** | **21000** | **490** | **3500** | **19000** | **120000** | **220000** |
| **Minimum** | **180** | **0.21** | **2100** | **2.5** | **940** | **76** | **22** | **840** | **3.4** | **38** | **44** | **60** | **2300** |