# Results of Wet Weather Water Quality Sampling around Arboretum Creek in January, 2019:

## FOAC Technical Memorandum #3[1]

-- Dave Galvin 3/6/2019

**SUMMARY:**

Friends of Arboretum Creek (FOAC) sampled three sites, two near the headwaters' area and one at the mouth of Arboretum Creek in early January, 2019, after a prolonged period of rain. This "wet weather" sampling was intended to collect water quality data during winter conditions at selected locations. All results support a hypothesis that the uphill/upstream springs that come off of the east side of Capitol Hill west of the Japanese Garden present clean water which currently flows into the combined sewer system and thus is lost to the creek.

**BACKGROUND:**

Friends of Arboretum Creek intends to document water quality and sediment quality issues related to Arboretum Creek as well as inputs to the creek and adjacent potential water sources, in order to better evaluate options for enhancing flows into Arboretum Creek in the future. With support from King County via a Waterworks grant, we have the capacity to collect and analyze a small number of samples so as to fill in gaps in current knowledge.

Two previous technical memos[2] documented all previously available data relative to the study area and dry weather water quality results from samples taken in September, 2018. These two previous documents assisted in the selection of a limited number of sites to sample during wet weather conditions.

**WET-WEATHER SAMPLING:**

We selected two sites previously sampled (sites #2 and #4 from the dry-weather data) in order to characterize the spring discharges from the site of Capitol Hill during winter conditions. In addition, we

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[1] This report can be cited as Galvin, Dave (2019a), *Results of Wet Weather Water Quality Sampling around Arboretum Creek in January, 2019: FOAC Technical Memorandum #3*, available from galvind53@gmail.com .

[2] Galvin, Dave (2018a), *A Summary of Previous Water Quality Studies of Arboretum Creek: FOAC Technical Memorandum #1* (last updated 8/13/2018), and Galvin, Dave (2018b), *Results of Dry Weather Water Quality Sampling around the Headwaters of Arboretum Creek in September, 2018: FOAC Technical Memorandum #2* (last updated 12/29/2018); both documents are available from galvind53@gmail.com .

sampled the mouth of Arboretum Creek near Elderberry Bridge in order to gain data for the entire creek during winter conditions. Our reasons for focusing on Alder Creek and Alleyway Creek are well described in our previous TM #2: these two springs offer consistent, year-round flows of water which might, if documented to be clean of pollution inputs, be considered for removal from the combined sewer in order to route the water back into the headwaters of Arboretum Creek. For the winter sampling, we chose to also collect an integrated flow from near the mouth of the creek to see if any water quality issues were different there compared with our earlier focus near the headwaters.

**SAMPLING and ANALYSIS:**

We continued to contract with King County's Environmental Lab (KCEL) to do the analyses of our samples. KCEL provided us with all of the sample bottles for collecting the samples. We followed all of the rigorous KCEL protocols for sample collection.

Sampling was done mid-day on **Wednesday, January 9, 2019**. This was during a typical period in Seattle's winter with a multi-day but relatively low intensity rain storm. Stormwater was not actively flowing off nearby streets during our sampling day, but wet winter weather had fully saturated the ground and offered a chance to test the sample sites during prolonged rain conditions.

Based on previous results, we opted to focus analytical parameters on nutrients (nitrogen and phosphorus), bacteria, and diesel and lube-oil organics, all as described in detail in the two previous technical memos. We chose to only analyze fluoride in the Alder Creek site where it had been previously detected. We chose to not analyze for "oil-and-grease" due to problems encountered with this parameter in previous tests.

**FINDINGS:**

Results from the sampling done on 1/9/2019, including tables for each sample containing the full analytical report from the King County Environmental Lab, are reported on the following pages. Within the data tables, note that there are certain qualifiers: "method detection limits" (MDLs), which usually reflect the minimum concentration that can reliably be reported for the analytical protocol used, and "reporting detection limits" (RDLs), which indicate less precision (more variability) in the protocol at low quantification levels.

Tables 1 – 3 provide the full range of results reported.

All results for the mouth of Arboretum Creek (sample 1) were low and well within ranges seen in previous samples and in other Seattle urban streams. Arboretum Creek appears to be quite clean for an urban waterway, at least for the parameters analyzed.

**Table 1: Results for Sample #1 at the mouth of Arboretum Creek.**

Project: 421874-860
Locator: NONE
Sample: L71650-1
Matrix: LG STORM WTR
ColDate: 1/9/2019
ClientLoc: Elderberry Bridge (Mouth of Arboretum Crk)
**WET Weight Basis**

| Parameters | Value | Qual | MDL | RDL | Units |
|---|---|---|---|---|---|
| **CV SM2540-D** | | | | | |
| Total Suspended Solids | 7.9 | | 0.5 | 1 | mg/L |
| **CV SM4110B FL** | | | | | |
| Fluoride | | | | | |
| **CV SM4500-N-C** | | | | | |
| Total Nitrogen | 1.32 | | 0.05 | 0.1 | mg/L |
| **CV SM4500-NO3-F** | | | | | |
| Nitrite + Nitrate Nitrogen | 0.846 | | 0.01 | 0.04 | mg/L |
| **CV SM4500-P-B,F** | | | | | |
| Total Phosphorus | 0.0776 | | 0.005 | 0.01 | mg/L |
| **CV SM4500-P-F** | | | | | |
| Orthophosphate Phosphorus | 0.02 | | 0.0005 | 0.002 | mg/L |
| **ES NONE** | | | | | |
| Sample Information | No Turbidity recorded | | | | none |
| **MC SM 9222D 20TH** | | | | | |
| Fecal Coliform | 37 | C | | | CFU/100ml |
| **MC SM9213D/3B** | | | | | |
| Escherichia coli | 35 | | | | CFU/100ml |
| **OR WDOE NWTPH-DX** | | | | | |
| Diesel Range (>C12-C24) | | <MDL | 0.189 | 0.189 | mg/L |
| Lube Oil Range (>C24) | | <MDL | 0.189 | 0.189 | mg/L |

<MDL = less than the Method Detection Limit
(no value is reported

C = confluent growth, value is an estimate

**Table 2: Results for Sample #2 at Alder Creek.**

Project: 421874-860
Locator: NONE
Sample: L71650-2
Matrix: LG STORM WTR
ColDate: 1/9/2019
ClientLoc: Alder Creek (28th & Prospect)

**WET Weight Basis**

| Parameters | Value | Qual | MDL | RDL | Units |
|---|---|---|---|---|---|
| **CV SM2540-D** | | | | | |
| Total Suspended Solids | 23.2 | | 1 | 2 | mg/L |
| **CV SM4110B FL** | | | | | |
| Fluoride | 0.0594 | | 0.02 | 0.04 | mg/L |
| **CV SM4500-N-C** | | | | | |
| Total Nitrogen | 2.63 | | 0.05 | 0.1 | mg/L |
| **CV SM4500-NO3-F** | | | | | |
| Nitrite + Nitrate Nitrogen | 2.15 | | 0.01 | 0.04 | mg/L |
| **CV SM4500-P-B,F** | | | | | |
| Total Phosphorus | 0.0906 | | 0.005 | 0.01 | mg/L |
| **CV SM4500-P-F** | | | | | |
| Orthophosphate Phosphorus | 0.0447 | | 0.0005 | 0.002 | mg/L |
| **ES NONE** | | | | | |
| Sample Information | Turbidity = 12.5 | | | | none |
| **MC SM 9222D 20TH** | | | | | |
| Fecal Coliform | 4 | | | | CFU/100ml |
| **MC SM9213D/3B** | | | | | |
| Escherichia coli | 21 | | | | CFU/100ml |
| **OR WDOE NWTPH-DX** | | | | | |
| Diesel Range (>C12-C24) | | <MDL | 0.189 | 0.189 | mg/L |
| Lube Oil Range (>C24) | | <MDL | 0.189 | 0.189 | mg/L |

<MDL = less than the Method Detection Limit
(no value is reported

C = confluent growth, value is an estimate

**Table 3: Results for Sample #3 at Alleyway Creek.**

Project: 421874-860
Locator: NONE
Sample: L71650-3
Matrix: LG STORM WTR
ColDate: 1/9/2019
ClientLoc: Alley Creek - midway between Aloha & Ward

**WET Weight Basis**

| Parameters | Value | Qual | MDL | RDL | Units |
|---|---|---|---|---|---|
| **CV SM2540-D** | | | | | |
| Total Suspended Solids | 5.2 | | 0.5 | 1 | mg/L |
| **CV SM4110B FL** | | | | | |
| Fluoride | | | | | |
| **CV SM4500-N-C** | | | | | |
| Total Nitrogen | 2.49 | | 0.05 | 0.1 | mg/L |
| **CV SM4500-NO3-F** | | | | | |
| Nitrite + Nitrate Nitrogen | 2.27 | | 0.01 | 0.04 | mg/L |
| **CV SM4500-P-B,F** | | | | | |
| Total Phosphorus | 0.0853 | | 0.005 | 0.01 | mg/L |
| **CV SM4500-P-F** | | | | | |
| Orthophosphate Phosphorus | 0.0376 | | 0.0005 | 0.002 | mg/L |
| **ES NONE** | | | | | |
| Sample Information | Turbidity = 4.6 | | | | none |
| **MC SM 9222D 20TH** | | | | | |
| Fecal Coliform | 410 | | | | CFU/100ml |
| **MC SM9213D/3B** | | | | | |
| Escherichia coli | 520 | | | | CFU/100ml |
| **OR WDOE NWTPH-DX** | | | | | |
| Diesel Range (>C12-C24) | | <MDL | 0.189 | 0.189 | mg/L |
| Lube Oil Range (>C24) | | <MDL | 0.189 | 0.189 | mg/L |

<MDL = less than the Method Detection Limit
(no value is reported

C = confluent growth, value is an estimate

Results for Alder Creek (sample 2) were also low and consistent with previous data. Fluoride was again detected, albeit at a very low level. This might indicate contribution from some uphill source of drinking water, but it does not appear at a significant level.

Results for Alleyway Creek (sample 3, mid-way between Aloha and Ward on 28th Ave. E) were low for most parameters and slightly elevated for bacteria (400-500 CFU range). While these bacteria levels are slightly higher than previously detected, they are consistent with earlier results from Frodge (2018) and still within what is considered a normal range for urban waters (creeks, stormwater runoff, nearby lakes in winter) as discussed in detail in our Technical Memo #1. The levels do not indicate contamination from broken or illicit sanitary sewer lines. Rather, they are more likely due to pet wastes from uphill residential yards.

**CONCLUSIONS:**

Our wet weather samples reinforce our findings to date that the two springs (Alder Creek and Alleyway Creek) uphill and west of the Japanese Garden appear to be clean groundwater. Levels of nutrients and bacteria are within normal ranges, and no contamination from stormwater sources has been seen. Levels of all parameters analyzed for were quite low at the mouth of Arboretum Creek, supporting a view that the relatively isolated current drainage area is mostly within the Washington Park Arboretum and relatively clean when compared to other urban streams.

**REFERENCES:**

Frodge, Jonathan. 2018. *Technical Memo: Arboretum Creek Preliminary Water Quality Data*. Seattle Public Utilities: internal report.

Galvin, D. 2018a. *A Summary of Previous Water Quality Studies of Arbortem Creek: FOAC Technical Memorandum #1*. Seattle, WA: Friends of Arboretum Creek.

Galvin, D. 2018b. *Results of Dry Weather Water Quality Sampling around the Headwaters of Arboretum Creek in September, 2018: FOAC Technical Memorandum #2*. Seattle, WA: Friends of Arboretum Creek.