The Environmental Protection Agency ordered the Potential Responsible Parties to collect analytical data at the Smurfit-Stone Frenchtown Mill Site on May 23, 2018. The sampling was conducted to address concerns representatives of Missoula City-County Government and the public had about a tea colored plume of water that could be seen adjacent to the outer berm of the Mill Site. Surface water was collected from two on-site ponds, the Clark Fork River and a ground water well located on-site. A map showing the sampling locations is attached to this email. The sampling plan follows:

Please see the following plan for surface water and groundwater sampling on May 23, 2017 at the former Smurfit-Stone/Frenchtown Mill Site.
The purpose of this work is to characterize the water chemistry of "tea" colored water observed along the river side of the southern HP13A berm on Tuesday 5/22/18.
The objective of this work is to identify any constituents of potential concern in the tea-colored water, and evaluate the origin of the tea-colored water by comparing to characteristics of nearby pond water, groundwater, and Clark Fork River water.

Field parameters and analytical samples will be collected from the following 7 locations (including 2 QC samples):

1. HP13A-pond (ponded water)
2. CFR-HP13A ("tea" water on the river side of the southern HP-13A berm)
3. CFR-2 (river water near outfall 3)
4. SMW11 (groundwater location nearest upgradient to HP13A)
5. HP2-pond (ponded water)
6. CFR-1 (near production well field on south end of site - background location)
7. CFR-Harpers (Harpers Bridge - background location)
8. Blind Duplicate of CFR-HP13A
9. ERB (equipment rinse blank, analytical sample only)

Each sample will be analyzed at Pace Analytical for common ions, and total and dissolved metals. A 48-hour turnaround time will be requested for analysis of metals in sample CFR-HP13A. Samples will be sent to Frontier Analytical for dioxins/furans. Sample collection and analysis will be conducted in accordance with methods presented in the RI Work Plan and subsequent addenda. GPS coordinates and general field conditions will be noted at each sample location. The groundwater level will be noted in SMW11.

Methods/Analytes, Bottles/Preservatives:

Field Parameters (collected in situ):
pH, conductivity, dissolved oxygen, temperature, redox potential

1 ea. Unfiltered, Unpreserved 500 mL HDPE:
2540C Total Dissolved Solids
300.0 IC Anions
2320B Alkalinity
4500H+ pH, Eletrometric
SM2510 Specific Conductance

1 ea. Unfiltered, H_2SO_4 preserved 500 mL HDPE:

353.2 Nitrate + Nitrite
SM4500-PE Total Phosphorus
TOC

1 ea. Filtered, HNO_3 preserved 250 mL HDPE:
6010 (Dissolved Metals: Ca, Mg, Na, K)
6020 (Dissolved Metals: Al, V, Cr, Fe, Mn, Co, Zn, As, Se, Ag, Cd, Sb, Ba, Tl, Pb)

1 ea. Unfiltered, HNO_3 preserved 250 mL HDPE:
6010 (Total Metals: Ca, Mg, Na, K)
6020 (Total Metals: Al, V, Cr, Fe, Mn, Co, Zn, As, Se, Ag, Cd, Sb, Ba, Tl, Pb)

2 ea. 1L Amber Glass
8290 Dioxins/Furans

The dioxin analytical results were submitted to the Agency on June 1, 2018. The analytical results are attached to this email. **Could I get some help concerning the dioxin data?**

The metal samples were submitted to the Agency on June 6, 2018. The analytical results are attached to this email. A summary of the analytical results follow

Groundwater well SMW-11

Concentrations that exceed the residential tapwater RSL based on HQ=0.1, Risk=1E-06: Arsenic, Chromium, Manganese, Thallium, and Vanadium.

- Thallium was reported as ND, but reporting limit shown in table is higher than tapwater SL; but lower than SL based on HQ=1
- Vanadium concentration does not exceed SL based on HQ=1.
    - Of note, the vanadium concentration measured here of 22.1 ug/L is noticeably elevated over the concentration measured in 6/2017 of 2.7 ug/L. But still below HQ=1.
- Chromium concentration exceeds SL based on Risk=1E-05 when using the tox value for hexavalent chromium adjusted assuming a ratio of 6:1 Cr(III):Cr(VI). But there is uncertainty as to the carcinogenicity of chromium by the oral route in general. Measured concentration does not exceed non-cancer based SL for Cr(VI).
- Arsenic and manganese exceed SLs based on HQ=1, Risk=1E-5.
    - Measured arsenic concentration is higher than the concentration measured in 6/2017 in this well; 37.5 ug/L versus 20 ug/L. Exceeds background GW listed in David's table of 5.1 ug/L.
    - Measured manganese concentration is lower than concentration measured in 6/2017 in this well; 6,830 ug/L versus 18,100 ug/L. Exceeds background GW listed in David's table of 2.2 ug/L.

Pond Water

Concentrations that exceed the residential tapwater RSL based on HQ=0.1, Risk=1E-06: Arsenic, Chromium, Cobalt, Manganese, and Thallium.

- Thallium was reported ND in both ponds, but reporting limit shown in table is higher than tapwater SL; but lower than SL based on HQ=1.

- Cobalt concentration in both ponds are lower than SL based on HQ=1.
- Chromium concentration below SL based on Risk=1E-05 when using the tox value for hexavalent chromium adjusted assuming a ratio of 6:1 Cr(III):Cr(VI).
- Manganese concentration in HP-2 is just below the SL based on HQ=1 (428 ug/L compared to SL of 430 ug/L). But concentration in HP-13A exceeds SL based on HQ=1 (953 ug/L compared to SL of 430 ug/L).
- Arsenic exceeds SL based on Risk=1E-05 in both ponds (5.4 ug/L in HP-2; 16.2 ug/L in HP-13A). Exceeds background GW listed in David's table of 5.1 ug/L.

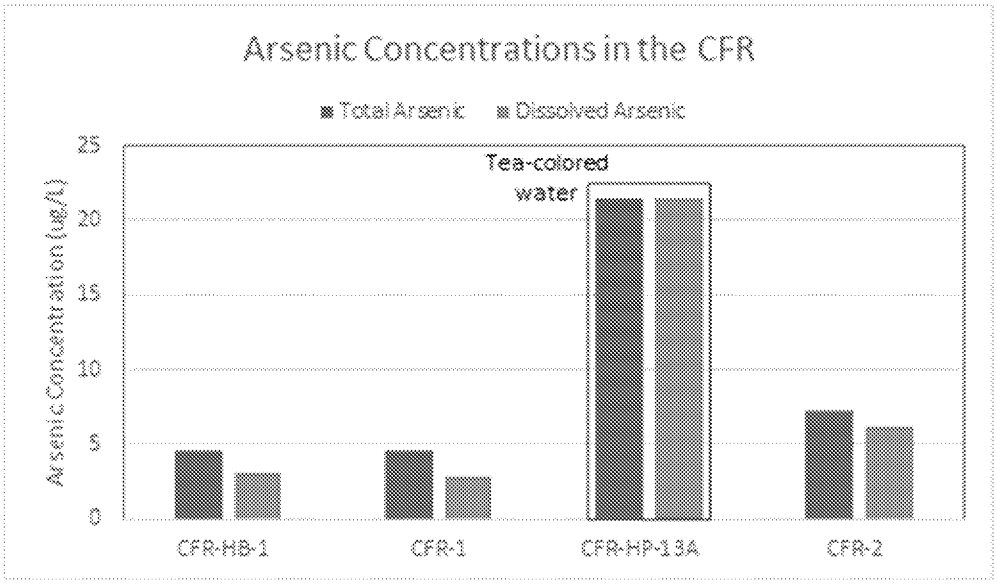
CFR

Concentrations that exceed the residential tapwater RSL based on HQ=0.1, Risk=1E-06: Arsenic, Chromium, Manganese, and Thallium.

- Thallium was reported ND at all locations, but reporting limit shown in table is higher than tapwater SL; but lower than SL based on HQ=1.
- Chromium concentrations below SL based on Risk=1E-05 when using the tox value for hexavalent chromium adjusted assuming a ratio of 6:1 Cr(III):Cr(VI).
- Manganese concentrations below the SL based on HQ=1 for all locations.
- Arsenic concentrations are above the residential SL based on Risk=1E-05 for all locations. From a human health perspective, we are concerned with exposures to recreational visitors, not residents though. We didn't quantify recreational risks to sw in the draft HHRA b/c the COPC screen found concentrations between site and upstream comparable. For a quick calculation, I pulled in exposure estimates from the Barker-Hughesville HHRA where we looked at campers ingesting surface water as drinking water and fisherman experiencing incidental ingestion of surface water. Using these exposure assumptions, HQs are below a level of concern (HQs<1) and cancer risks for RME receptors are as follows:

	Camper	Fisher
CFR-HB-1	1E-05	8E-08
CFR-1	1E-05	8E-08
CFR-HP-13A	6E-05	4E-07
CFR-2	2E-05	1E-07

Here is what the concentration data look like when looking from upstream to downstream spatially:



We are still waiting on mercury data from the labs. We will release the data when it is received from the PRPs.

Toxic Equivalency

Because dioxin and furan congeners act by the same mechanism as 2,3,7,8-TCDD, data for dioxin and furan congeners are converted to a TCDD toxicity equivalent value (TEQ) by computing the sum across congeners of the product of congener-specific concentration and relative Toxicity Equivalence Factors (TEFs):

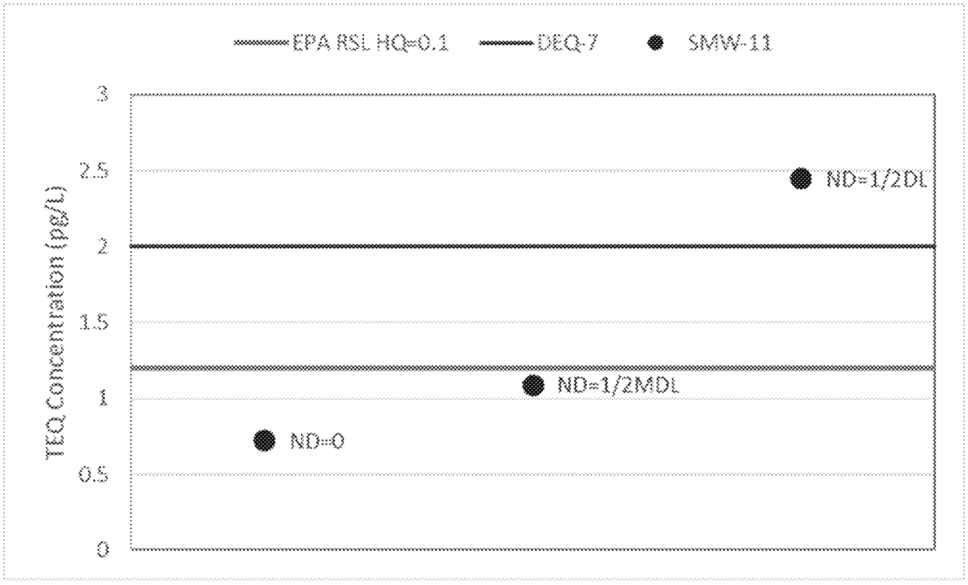
$$TEQ = \sum (C_{congener} \times TEF_{congener})$$

EPA Region 8 calculates TEQ by evaluating non-detects at ½ the sample-specific detection limit (DL). The DL represents the lowest possible amount of an analyte that is not detectable for that sample. These levels can vary based on chemical and matrix interferences, samples sizes, and instrument performance. The DL value is sample specific which differs from the method detection limit (MDL) which is a statistically driven value that represents the minimum concentration of an analyte that can be measured by the instrument with 99% confidence.

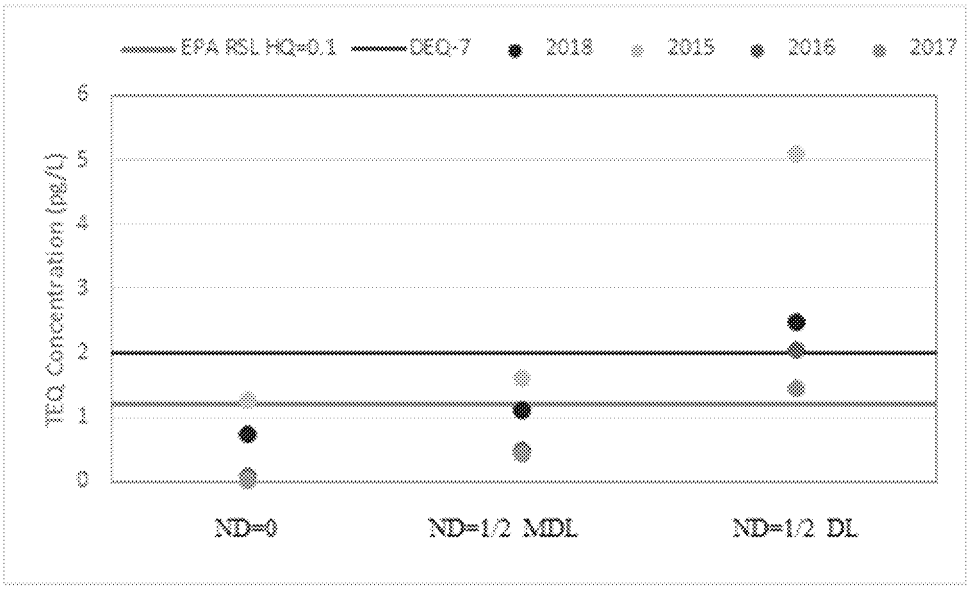
Groundwater well SMW-11
TEQ (ND=1/2 DL) = 2.45 pg/L.

- Exceeds DEQ-7 groundwater criteria for human health of 2 pg/L.
- Exceeds the EPA residential tapwater SL of 1.2 pg/L based on HQ=0.1.
- Does not exceed the EPA residential tapwater SL of 12 pg/L based on an HQ=1.
- Sensitivity Analysis:
    - TEQ (ND=0) = 0.723 pg/L; below EPA residential tapwater SL based on HQ=0.1.
    - TEQ (ND=1/2MDL) = 1.09 pg/L; below EPA residential tapwater SL based on HQ=0.1.
    - Calculated TEQ concentrations do not exceed DEQ-7 when evaluating non-detects at ½ MDL or at zero. Whereas, TEQ calculated evaluating non-detects at ½ DL does exceed DEQ-7 groundwater criteria. This is because in this sample, 11 congeners were reported

as not detected and the reported MDLs are below the criteria value. No congener was detected above the laboratory reporting limit, and six of the 17 D/F congeners were detected at concentrations below the calibration curve and were J-qualified by the laboratory.



- TEQ concentration is comparable to TEQ concentrations measured in this well during previous sampling events:
  - December 2015: 5.06 pg/L
  - June 2016: 2.03 pg/L
  - June 2017: 1.44 pg/L

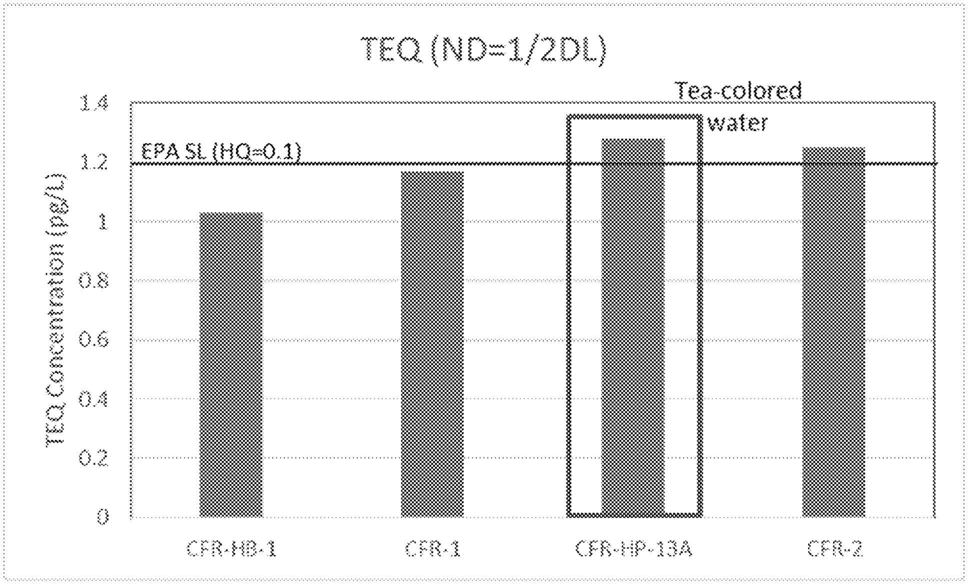


Pond Water

TEQ (ND=1/2 DL) = 1.42 pg/L in HP-2 and 1.82 pg/L in HP-13A.

- Exceeds DEQ-7 surface water criteria for human health of 0.05 pg/L.
- Exceeds the EPA residential tapwater SL of 1.2 pg/L based on HQ=0.1.
- Does not exceed the EPA residential tapwater SL of 12 pg/L based on an HQ=1.
- Sensitivity Analysis:
    - TEQ (ND=0) = 0.025 pg/L in HP-2 and 0.040 pg/L in HP-13A; below EPA residential tapwater SL based on HQ=0.1; below DEQ-7 surface water criteria
    - TEQ (ND=1/2MDL) = 0.45 pg/L in HP-2 and 0.43 pg/L in HP-13A; below EPA residential tapwater SL based on HQ=0.1; above DEQ-7 surface water criteria;
    - Calculated TEQ concentrations based on evaluating non-detects at ½ MDL remain above DEQ-7 surface water criteria (same result when evaluating non-detects at ½ DL). Only one congener was detected in the HP-2 sample (1,2,3,4,6,7,8-HpCDD), only two congeners were detected in the HP-13A sample (1,2,3,4,6,7,8-HpCDD and 1,2,3,4,6,7,8,9-OCDD) and all reported detected values were J-qualified by the laboratory (i.e., concentration is below the calibration curve). The MDL values were higher than DEQ-7 surface water criteria.

CFR



- TEQ exceeds DEQ-7 surface water criteria when evaluating non-detects at ½ DL.
- TEQ does not exceed EPA residential tapwater SL based on HQ=1.0.
- TEQ based on evaluating non-detects at ½ DL exceeds the EPA residential tapwater SL based on HQ=0.1 for the tea-colored water sample and the sample collected at CFR-2.
- Sensitivity Analysis:
    - TEQ(ND=0) does not exceed DEQ-7 or EPA SLs at any location
    - TEQ(ND=1/2MDL) does not exceed EPA SLs at any location, but does exceed DEQ-7 at all locations.
    - MDL values exceed DEQ-7 criteria. Detected concentrations reported by the laboratory were all J-qualified. Detection frequencies (number of congeners detected divided by 17 congeners analyzed) were:

CFR-HB-1	6%
CFR-1	18%
CFR-HP-13A	0%
CFR-2	12%

Complicating Factors

Deionized Water (blank sample)

- Two congeners were detected in the blank sample and J-qualified
    - 1,2,3,4,6,7,8-HpCDD = 1.94J pg/L
    - 1,2,3,4,6,7,8,9-OCDD = 8.61J pg/L
- TEQ(ND=1/2DL) = 1.39 pg/L.
    - Exceeds DEQ-7 surface water criteria.
    - Exceeds EPA residential tapwater SL based on HQ=0.1.

Conclusion:

Although robust conclusions cannot be readily drawn from this limited dataset, it does not appear that TEQ in CFR surface water below HP13A was discernable from background CFR surface water (Harper's Bridge) at the time that these samples were collected. Further, these data are similar to 2015 surface water TEQ data measured in 11 samples collected from the CFR at locations 3 miles downstream of the Smurfit-Stone site, upstream through Missoula (range: 1.04 – 1.73 pg/L). One sample taken near HP13A in the CFR in 2015 (SW3-CFR) had a TEQ concentration of 1.4 pg/L. This dataset should be interpreted with caution since some conclusions are largely dependent on which non-detect substitution method is used (½ DL, ½ MDL, 0).