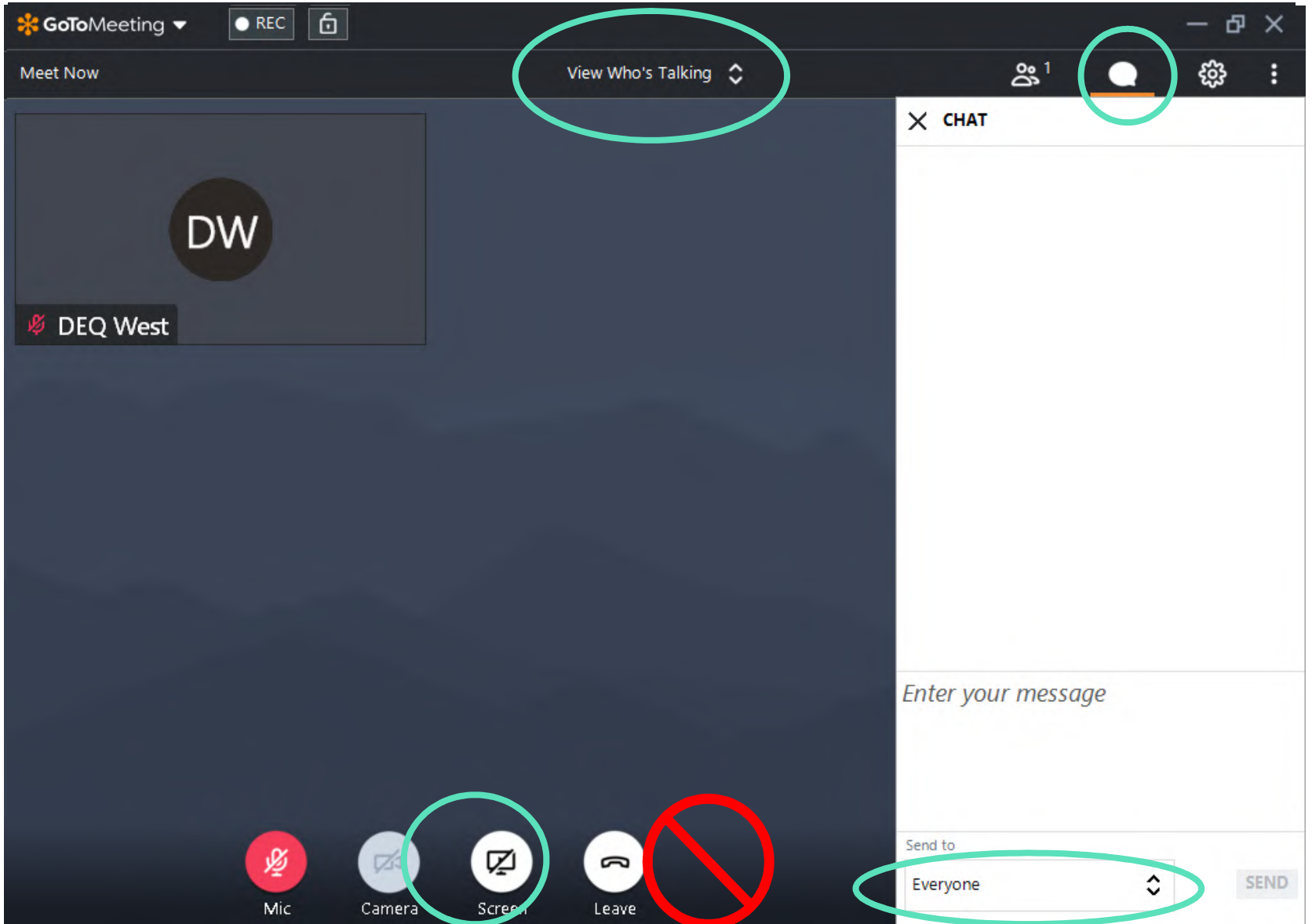
Sand Branch Benthic TMDL Study

Second Technical Advisory Committee Meeting

Sarah K. Sivers
Water Quality Planning Team Lead
Virginia Department of Environmental Quality
January 25, 2021

Getting Familiar with GoToMeeting



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Agenda

- Welcome and introductions
- TMDL study updates
  - Watershed tour
  - Updated information
  - Water quality monitoring
- Stressor analysis overview: Part I
  - Water chemistry data analysis
- Discussion
- Wrap-up and next steps

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TMDL Study Updates

Watershed Tour

- Purpose: Familiarize DEQ and DEQ's contractor with watershed
  - Held December 10th
- Areas Viewed:
  - DEQ Monitoring Stations
  - General watershed/stream characteristics
  - Select areas of the watershed boundary
  - 4 VPDES permit-holders
    - Loudoun Composting (VA0091430)
    - Superior Concrete (VAG110094)
    - Chantilly Crushed Stone (VAG840106)
    - Virginia Paving Company (VAR050863)

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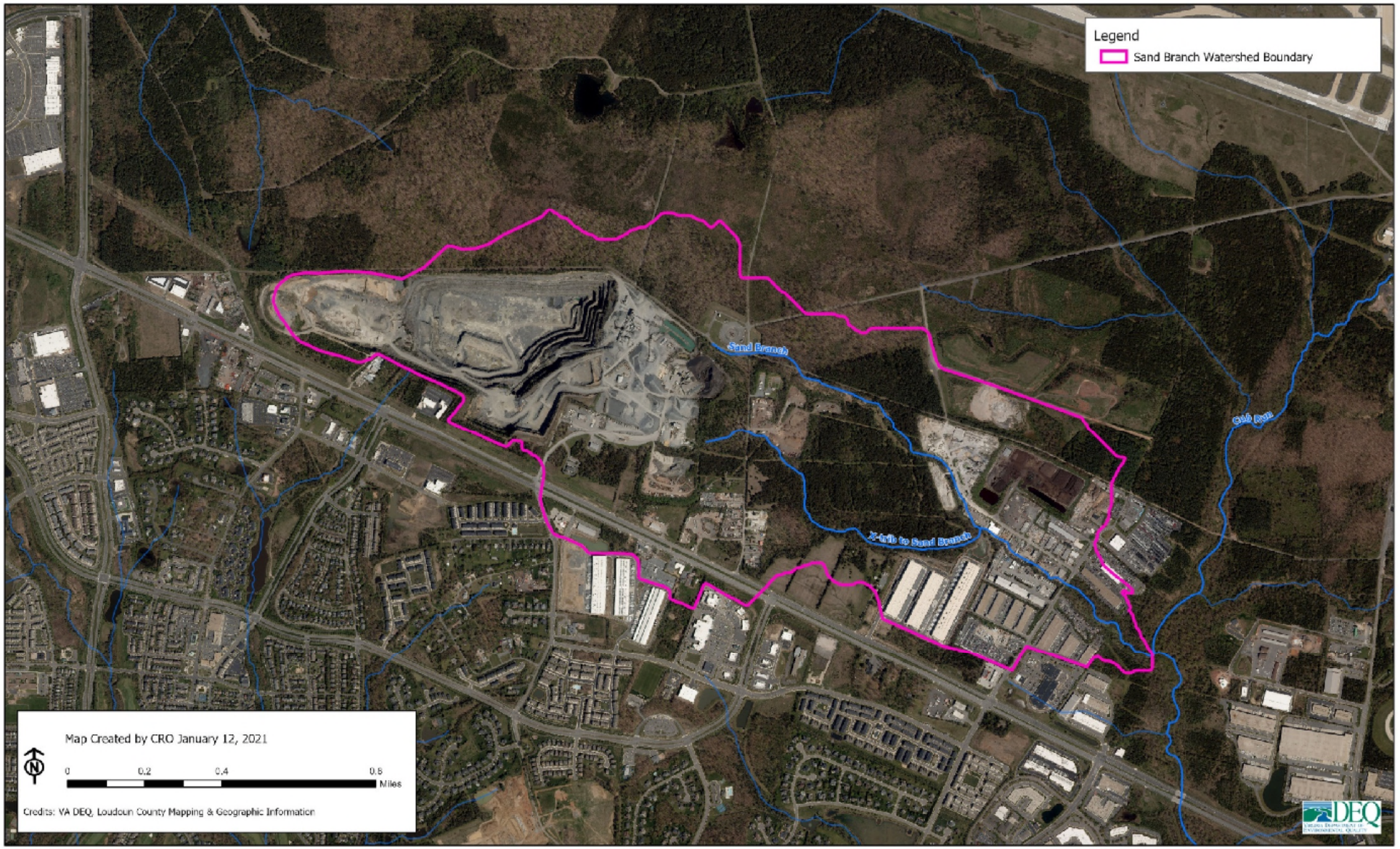
Revised Watershed Boundary



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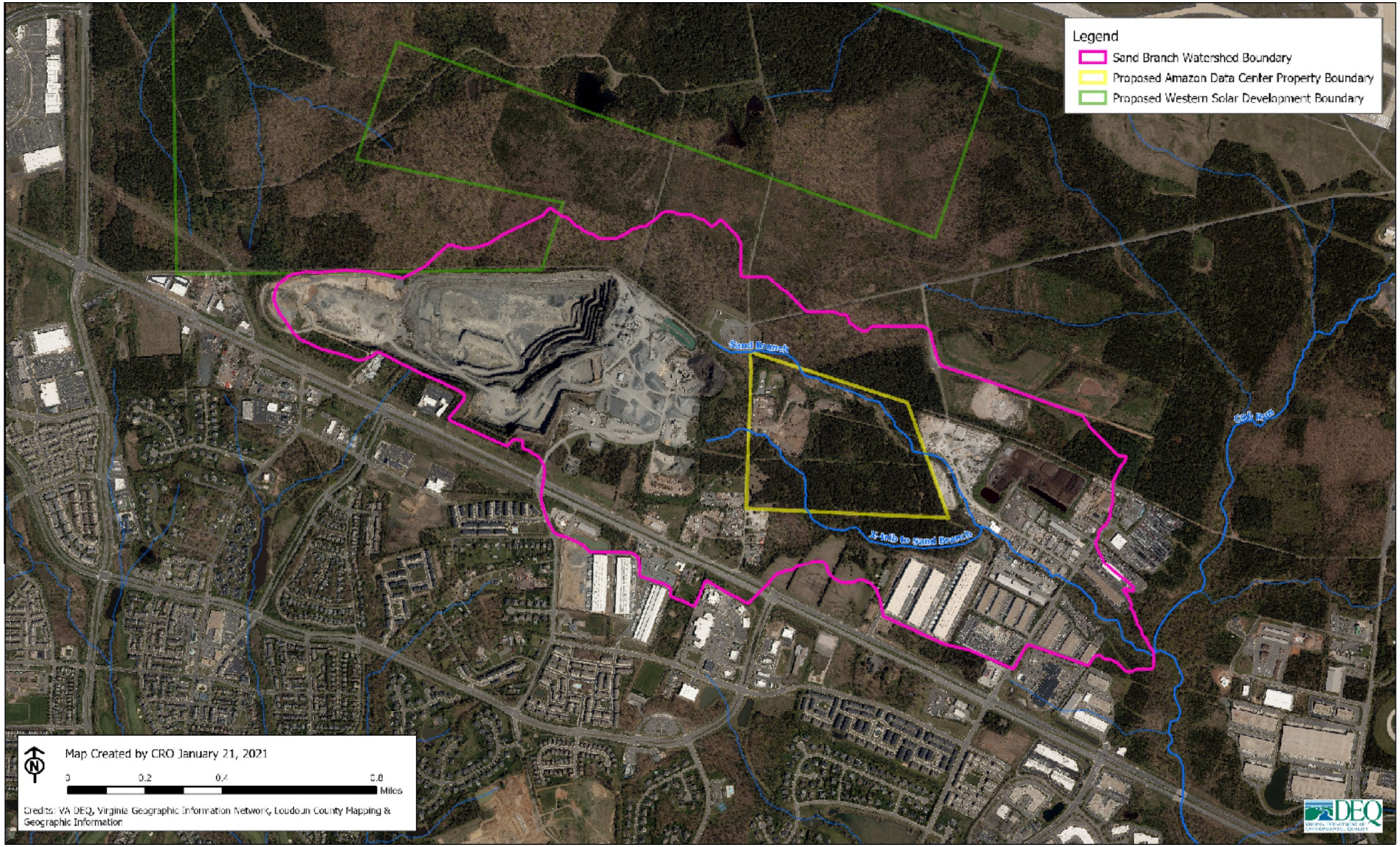
Future Land Use



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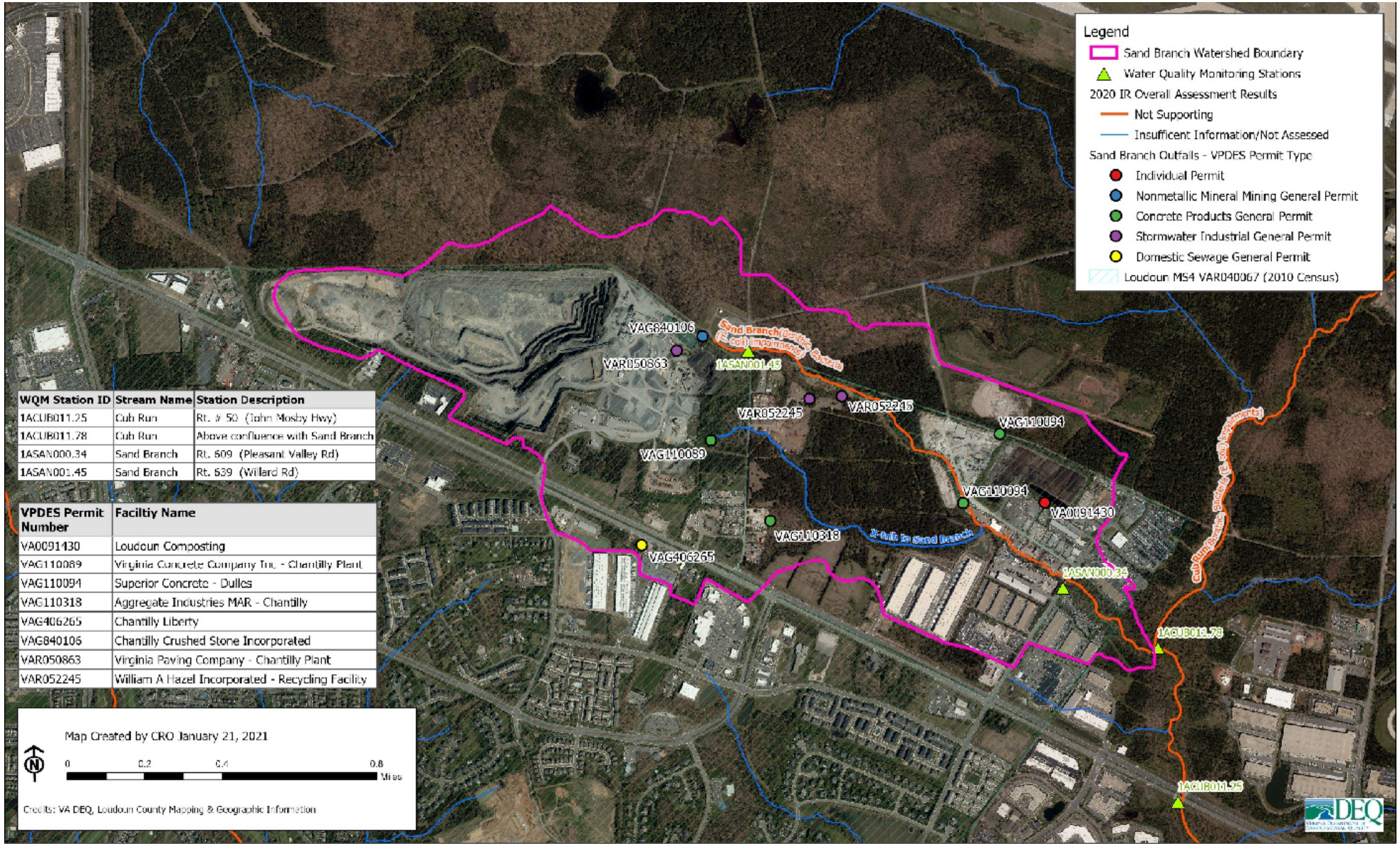
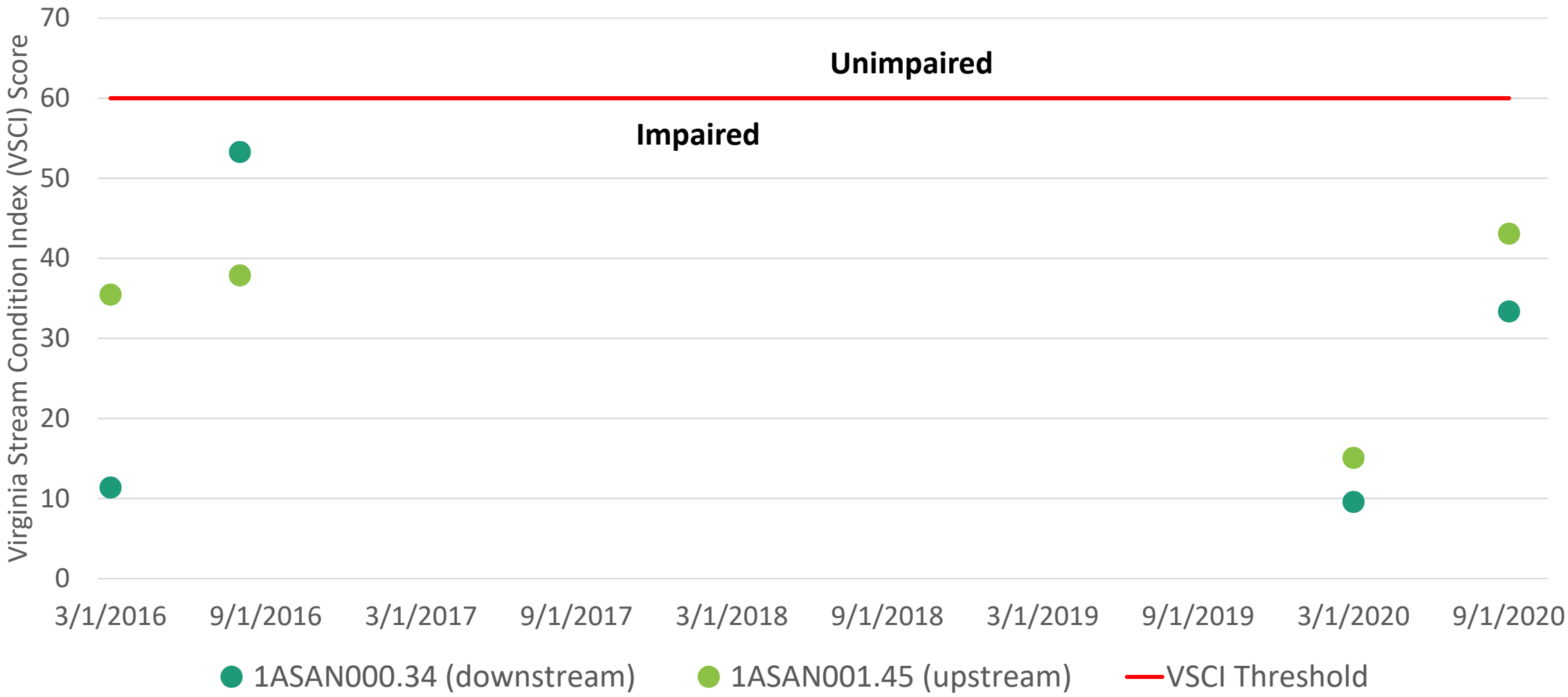
Updated Project Map



WQM Station ID	Stream Name	Station Description
1ACUB011.25	Cub Run	Rt. # 50 (John Mosby Hwy)
1ACUB011.78	Cub Run	Above confluence with Sand Branch
1ASAN000.34	Sand Branch	Rt. 609 (Pleasant Valley Rd)
1ASAN001.45	Sand Branch	Rt. 639 (Willard Rd)

VPDES Permit Number	Faciltiy Name
VA0091430	Loudoun Composting
VAG110089	Virginia Concrete Company Inc - Chantilly Plant
VAG110094	Superior Concrete - Dulles
VAG110318	Aggregate Industries MAR - Chantilly
VAG406265	Chantilly Liberty
VAG840106	Chantilly Crushed Stone Incorporated
VAR050863	Virginia Paving Company - Chantilly Plant
VAR052245	William A Hazel Incorporated - Recycling Facility

Sand Branch VSCI Scores



DEQ Water Quality Monitoring

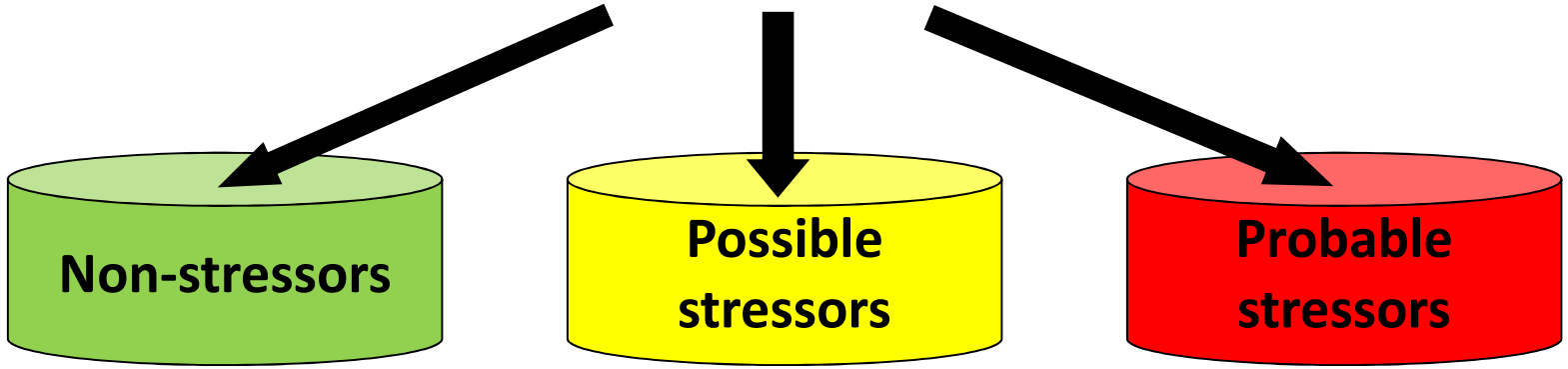
- Further data collection to support TMDL development
  - Source identification
  - TMDL thresholds
- Continuous Monitoring Data
  - 1 probe deployed in Aug. 2020 for 2 weeks: Sand Branch
  - 2 probes deployed Dec. 10th: Sand Branch and Licking Run (reference watershed)
  - Parameters: pH, DO, Conductivity, Turbidity, Temperature
  - Water chemistry sample (1) collected from Sand Branch

Stressor Analysis: Components

Refresher: Benthic Stressor Analysis

"What is causing the benthic community to be unhealthy?

1. List all potential causes applicable to the watershed
   - For example: nutrients, sediment, toxics, etc.
2. Analyze the available data and information for and against each possible stressor
   - Such as water chemistry, habitat, land use, point and nonpoint sources
3. Categorize each cause into:



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Considerations for Water Chemistry Data Analysis

- Monitoring data evaluation:
  - Comparison to Water Quality Standards (9VAC25-260)
  - Comparison to stressor thresholds developed from DEQ's Freshwater Probabilistic Monitoring Program[1]
  - Seasonal or daily water quality variations
- Other relevant data considered:
  - Hydrology (stream flow and precipitation)
  - Potential influence of Triassic Basin geology
  - Surrounding land uses

[1]DEQ, 2017. Stressor Analysis in Virginia: Data Collection and Stressor Thresholds. DEQ Technical Bulletin WQA/2017-001

Considerations for Biological Data Analysis*

- Review individual metrics of the Virginia Stream Condition Index Score (VSCI) that likely resulted in low scores
- Identify tolerance, sensitivity, taxonomic composition, and functional feeding group of collected benthic organisms
- Bioassay of ambient water sample (downstream DEQ sample location) to learn if the stream exhibits toxicity

- USEPA's Causal Analysis/Diagnosis Decision Information System (CADDIS)

*To be covered at the next TAC meeting

Refresher: DEQ Water Quality Monitoring Data

- Chemical (2015-2020)
  - Field parameters (pH, dissolved oxygen, specific conductivity, temp.)
  - Solids (total dissolved solids, total suspended solids)
  - Nutrients (nitrogen, phosphorous)
  - Ionic strength
  - Metals

  **Limited samples collected in 2020*
- Benthic macroinvertebrates (2016 and 2020)
- Bioassay (Toxicity) Testing (ambient)
  - Acute and chronic (1 sample - 2020)
  - Water flea (*Ceriodaphnia dupia*) and Fathead minnow (*Pimephales promelas*)
- Effluent monitoring (collected by VPDES Permit-holders and DEQ, 2014-2018)

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Stressor Analysis

Water Chemistry Data Analysis

Chemical / Physical Parameters Analyzed

Candidates <u>with</u> stressor thresholds[1,2]:	***pH***	***Dissolved Oxygen (DO)***	Total Phosphorous	Total Dissolved Solids (TDS)	Dissolved Potassium
	Temperature	Specific Conductivity	Total Nitrogen	Dissolved Sulfate	***Dissolved Chloride***
	Sediment[3]	Dissolved Sodium	Metal Cumulative Criterion Unit (Metals CCU)		***Individual Metals, Dissolved***
Candidates <u>without</u> stressor thresholds[2]:	Total Suspended Solids (TSS)		***Ammonia***	DO (Saturation)	Turbidity

[1]DEQ's Freshwater Probabilistic Monitoring Program (DEQ, 2017. Stressor Analysis in Virginia: Data Collection and Stressor Thresholds. DEQ Technical Bulletin WQA/2017-001)

[2]Where water quality criteria exists for a parameter, that value was also in the analysis (Water Quality Standards, 9VAC25-260). Those parameters with criteria are denoted in bold, italicized text.

[3] Sediment was evaluated using Log Relative Bed Stability (LRBS) index and Habitat.

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Stressor Thresholds: Definitions of Stress Probabilities

Probability of Stress to Aquatic Life	Definition
High Probability	Values that are the highest in Virginia, resulting in degradation of the benthic community.
Medium Probability	Noticeable evidence of harm causing a possible shift in benthic communities, changes noticeably above background conditions.
Low Probability	Slightly above background conditions, but unlikely to cause a major benthic community shift.
No Probability	Background conditions.

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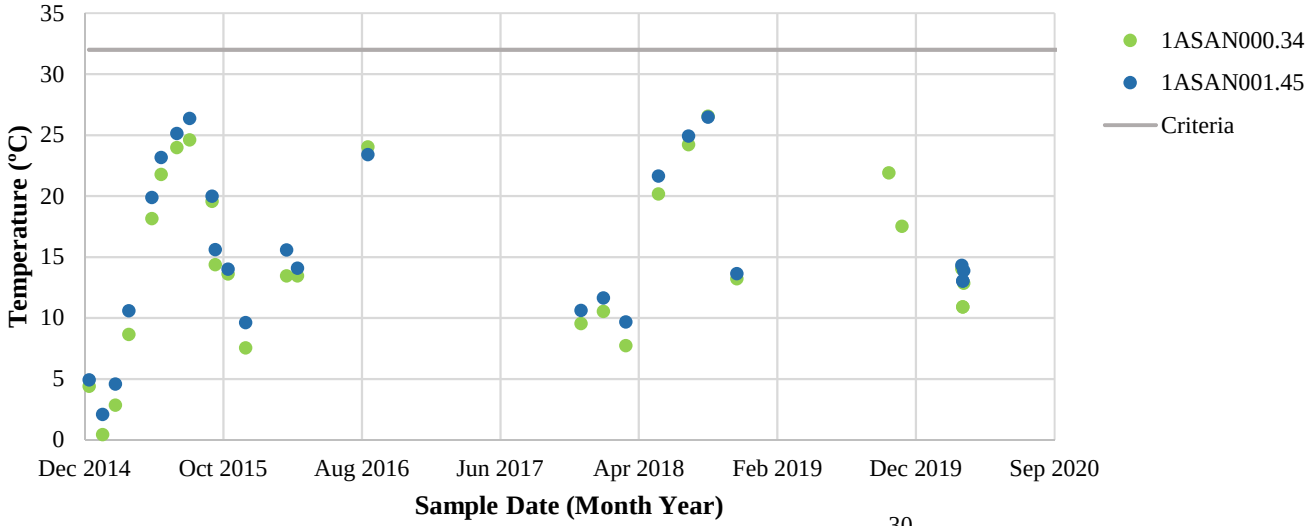
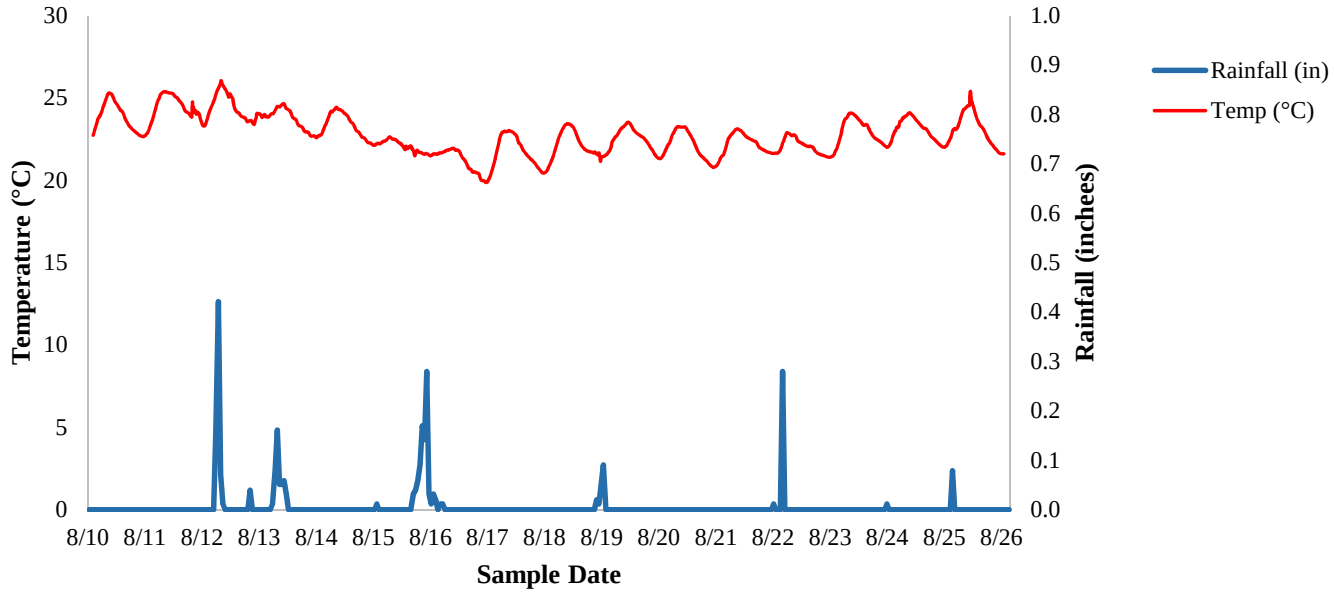
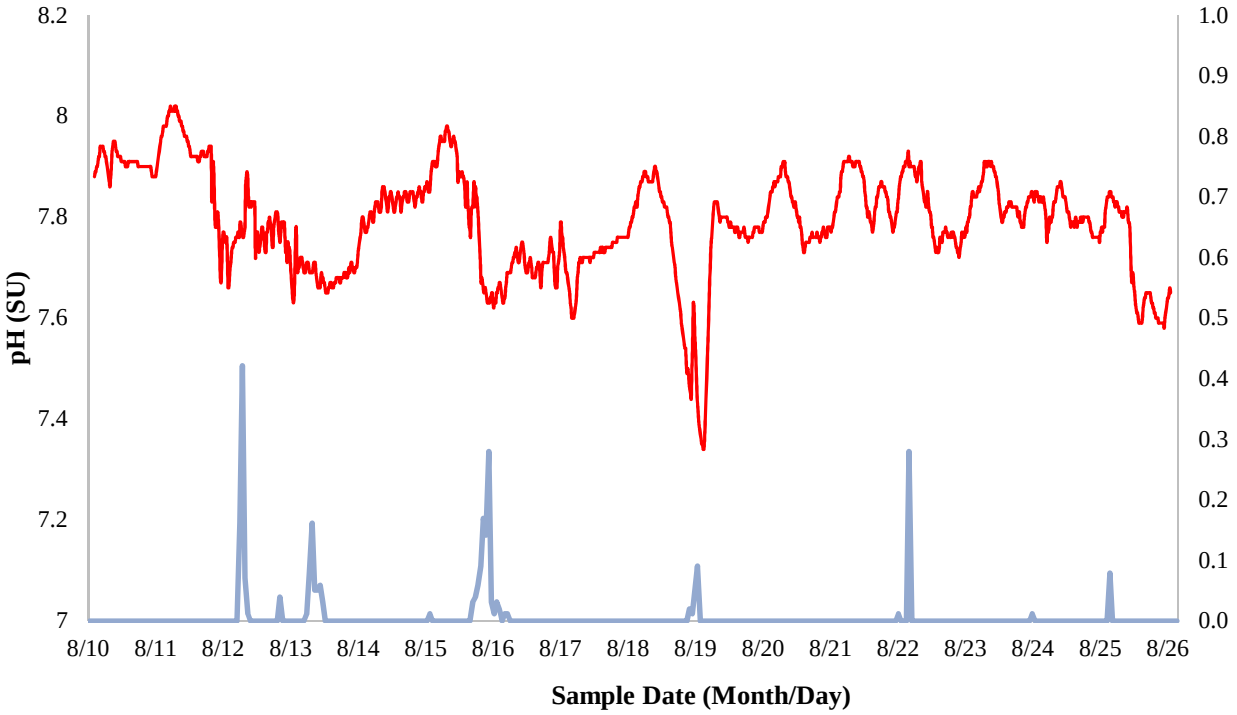
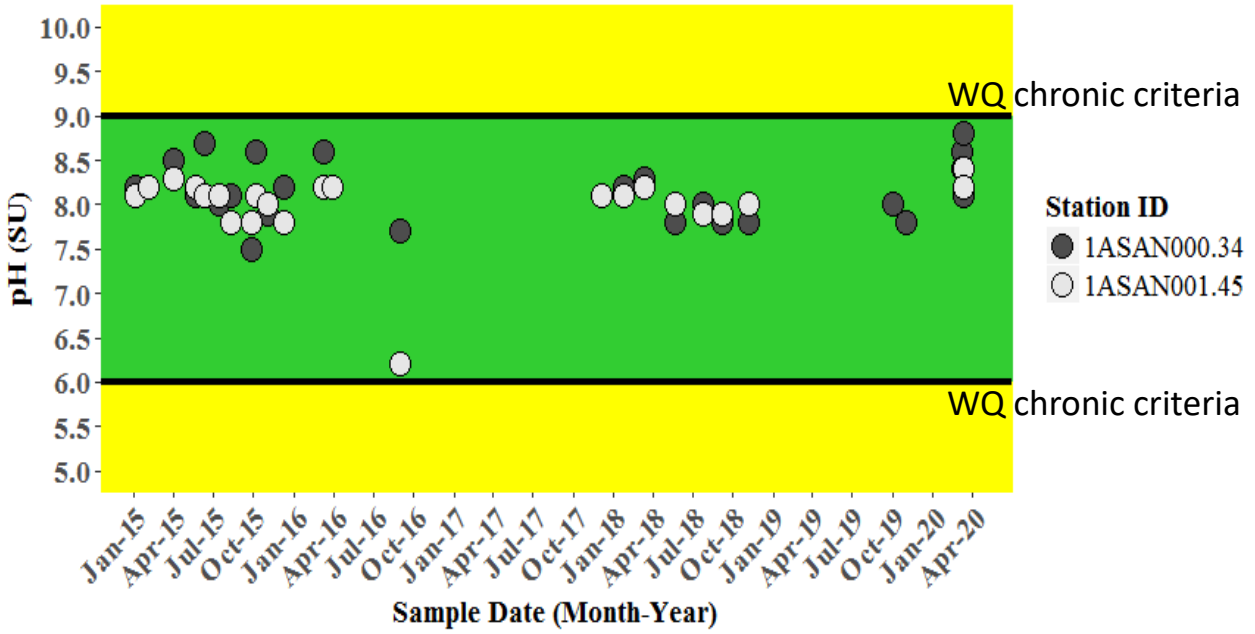
Temperature



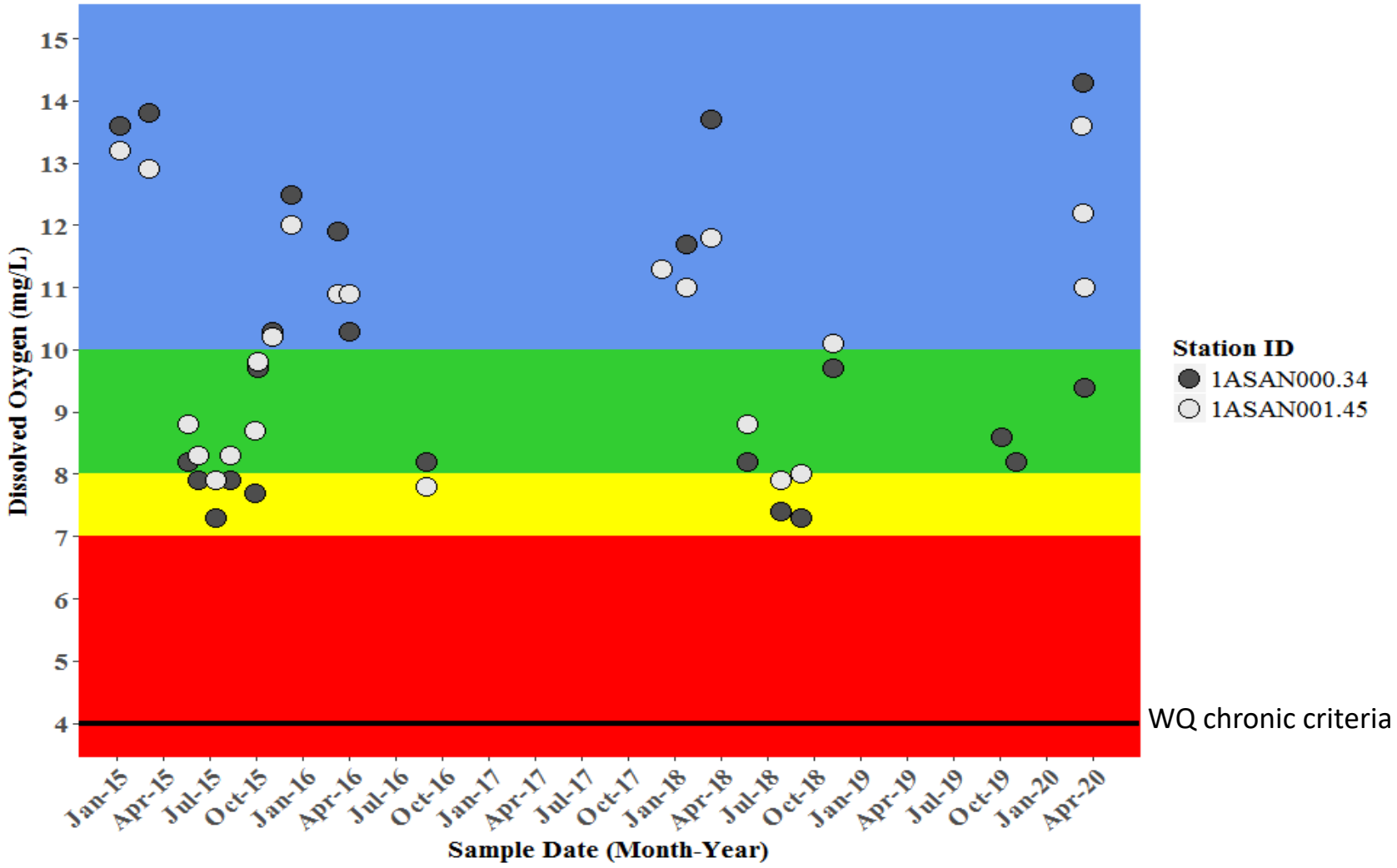


pH

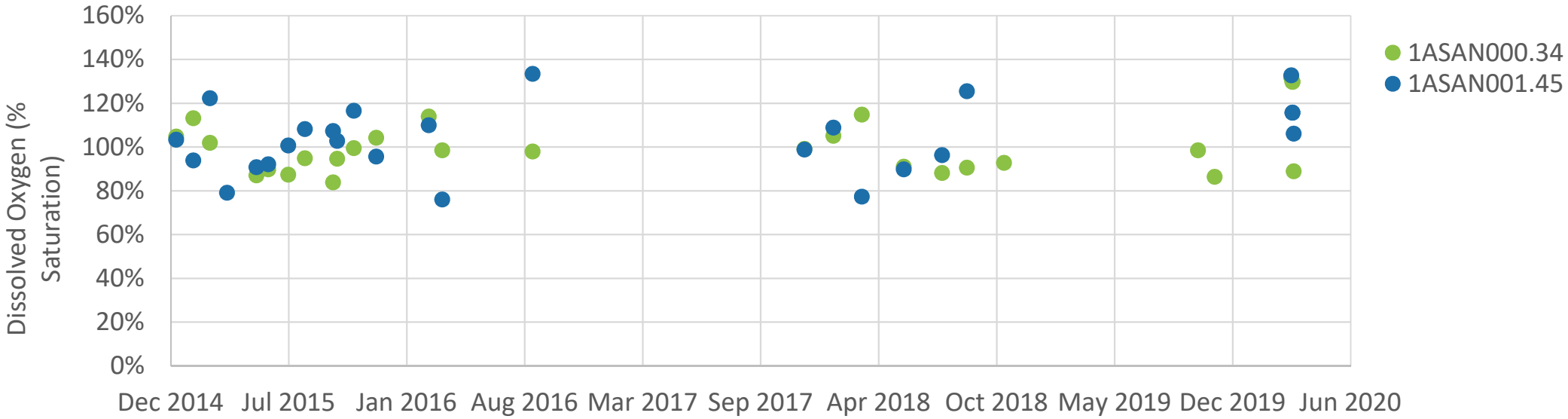

8.2
8
7.8
7.6
7.4
7.2
7
pH (SU)
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Rainfall (inches)
Rainfall (in)
pH (SU)
8/10 8/11 8/12 8/13 8/14 8/15 8/16 8/17 8/18 8/19 8/20 8/21 8/22 8/23 8/24 8/25 8/26
Sample Date (Month/Day)

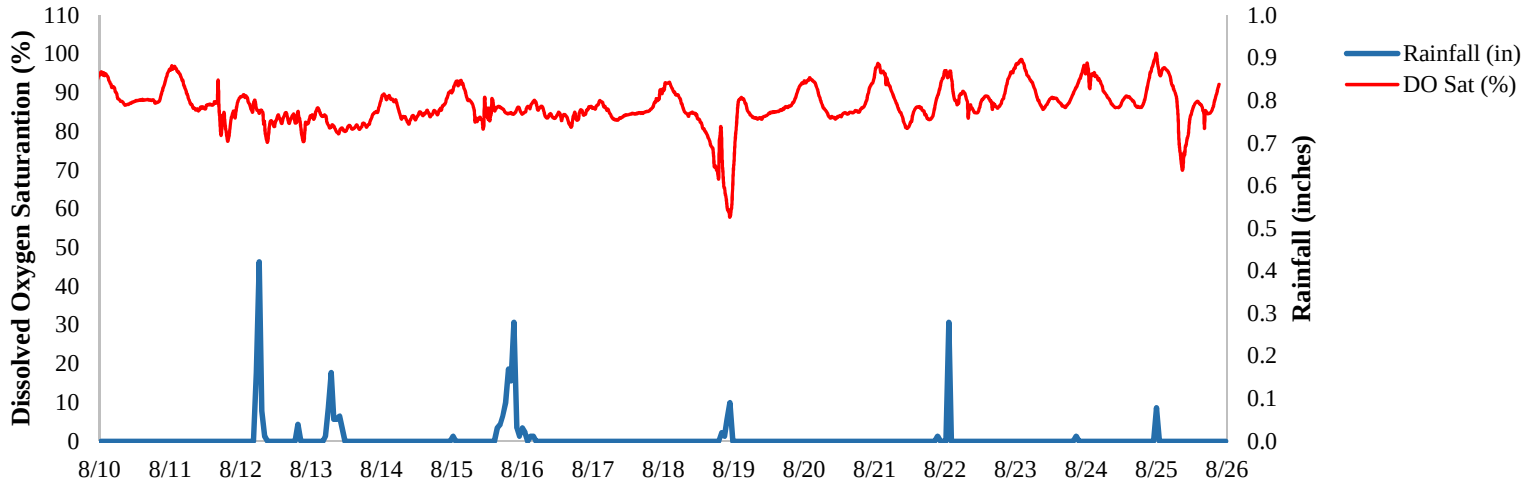

10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
pH (SU)
WQ chronic criteria
WQ chronic criteria
Station ID
1ASAN000.34
1ASAN001.45
Jan-15 Apr-15 Jul-15 Oct-15 Jan-16 Apr-16 Jul-16 Oct-16 Jan-17 Apr-17 Jul-17 Oct-17 Jan-18 Apr-18 Jul-18 Oct-18 Jan-19 Apr-19 Jul-19 Oct-19 Jan-20 Apr-20
Sample Date (Month-Year)

Dissolved Oxygen

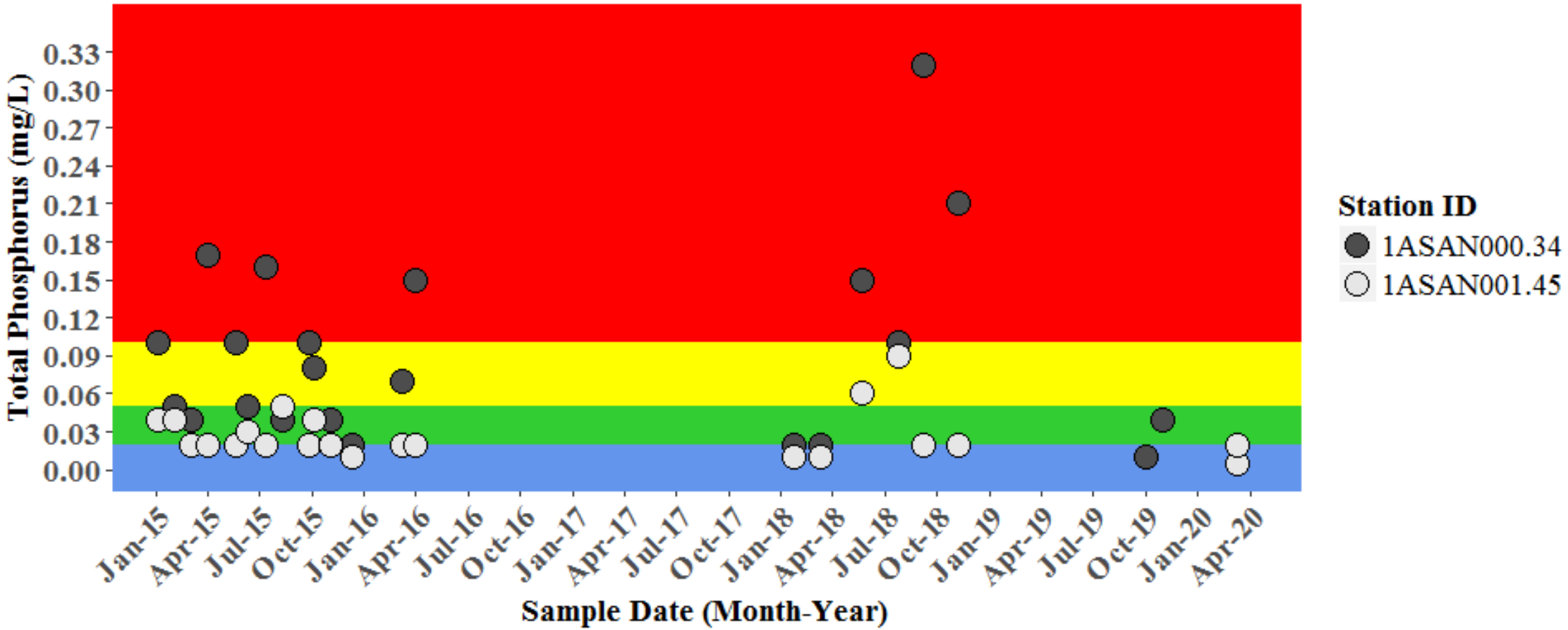


Dissolved Oxygen (Saturation)





Total Phosphorous



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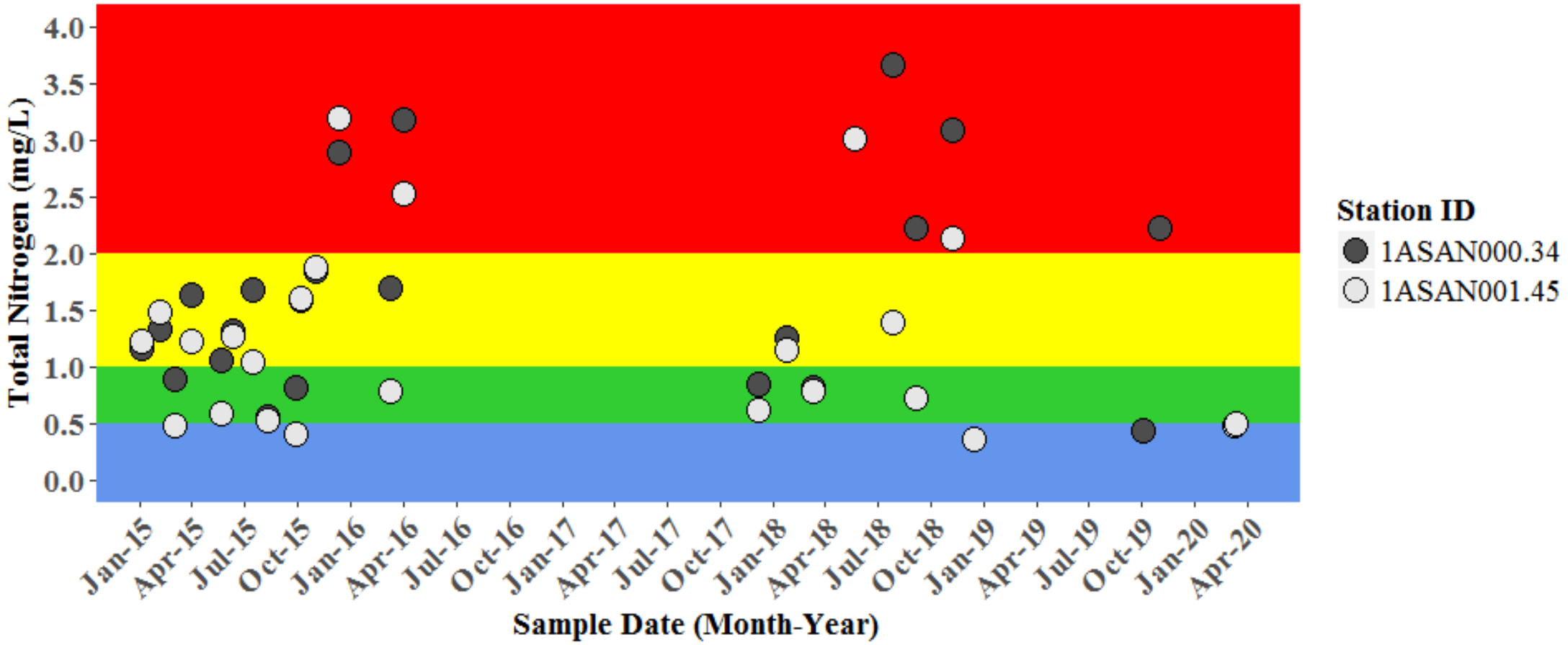
Total Nitrogen



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Ammonia[1]

	1ASAN000.34			1ASAN001.45		
Monitoring Date	Ammonia (mg/L)	Acute Criteria (mg/L)	Chronic Criteria (mg/L)	Ammonia (mg/L)	Acute Criteria (mg/L)	Chronic Criteria (mg/L)
12/5/2017	0.0069	6.95	1.921	0.0069	6.69	1.736
1/23/2018	0.01	5.84	1.555	0.008	7.08	1.711
3/12/2018	0.03	4.81	1.464	0.008	5.51	1.559
5/22/2018	1.5	12.80	1.569	0.06	8.25	1.034
7/26/2018	0.06	9.06	0.949	0.04	10.13	0.986
9/6/2018	0.36	11.92	0.999	0.02	9.58	0.859
11/8/2018	0.48	11.30	2.228	0.02	9.06	1.839
10/3/2019	0.05	8.90	1.079			
10/31/2019	0.02	13.25	1.900			
3/9/2020	0.014	2.46	0.558	0.014	3.96	0.867
3/11/2020	0.014	6.43	1.651	0.014	4.04	0.956

[1] Acute and chronic criteria are calculated using pH and temperature data collected concurrently with the ammonia data.

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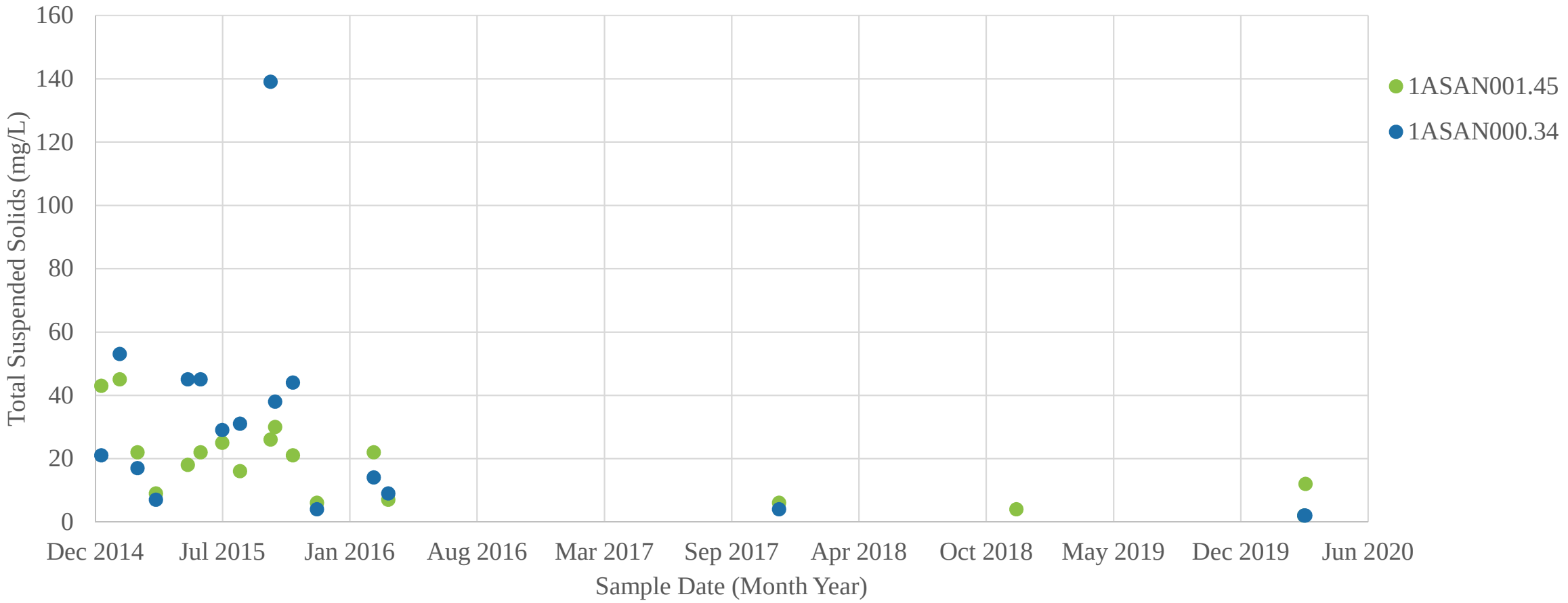
Total Suspended Solids (TSS)



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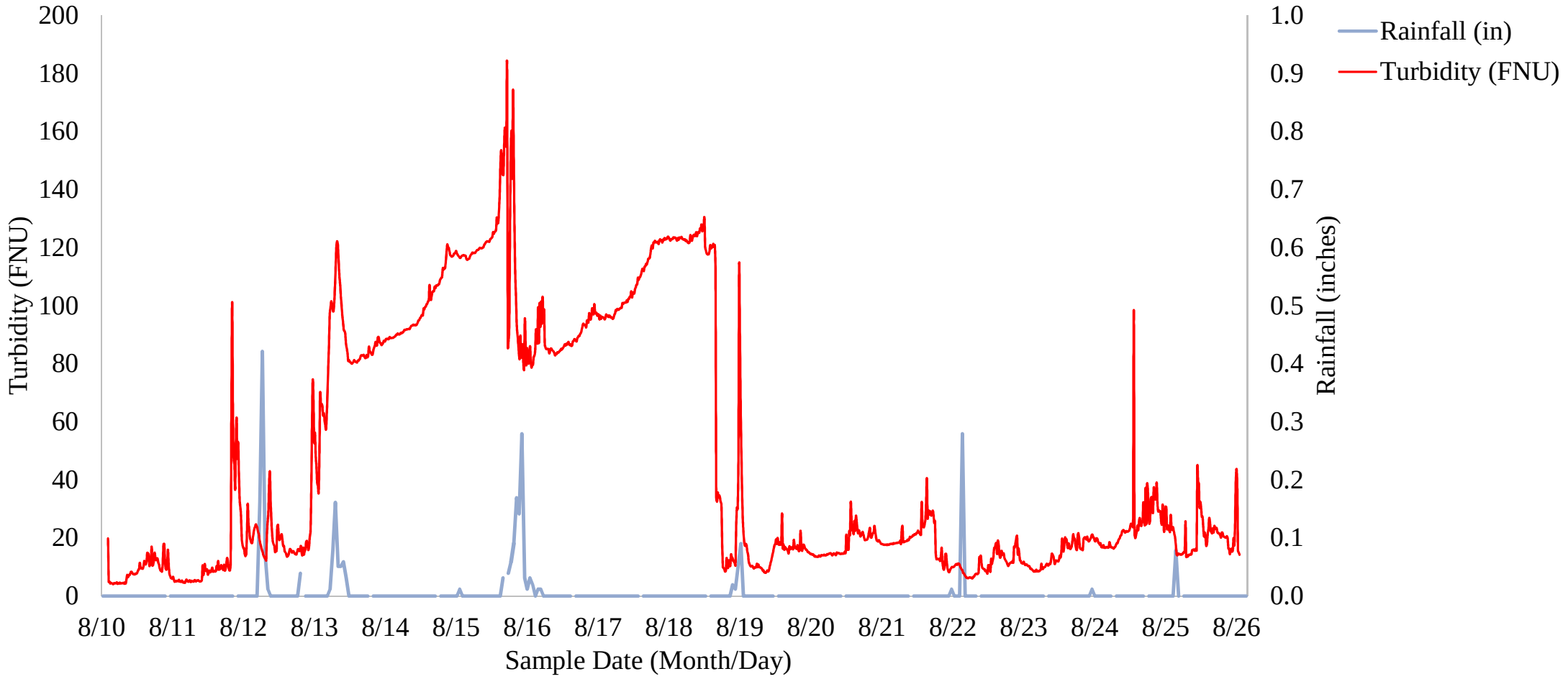
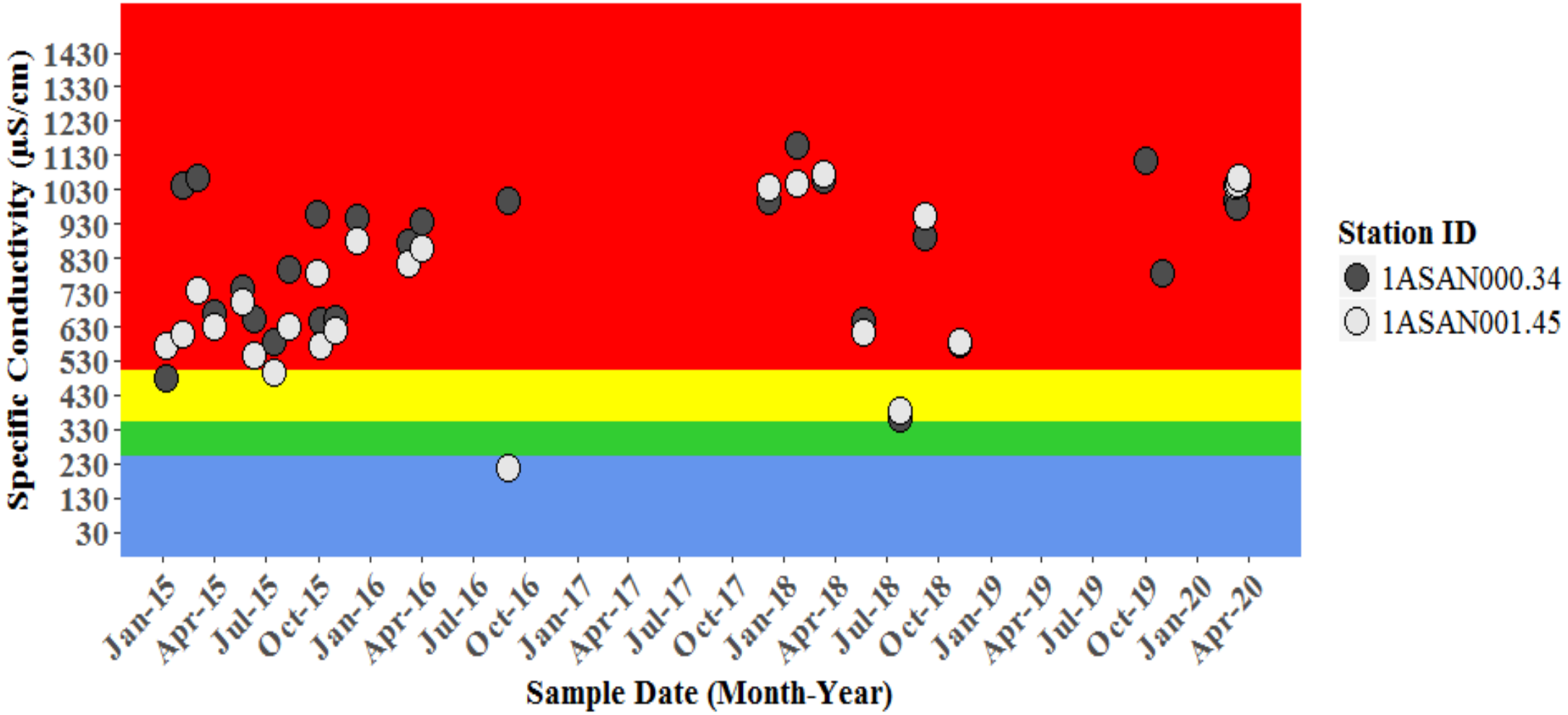
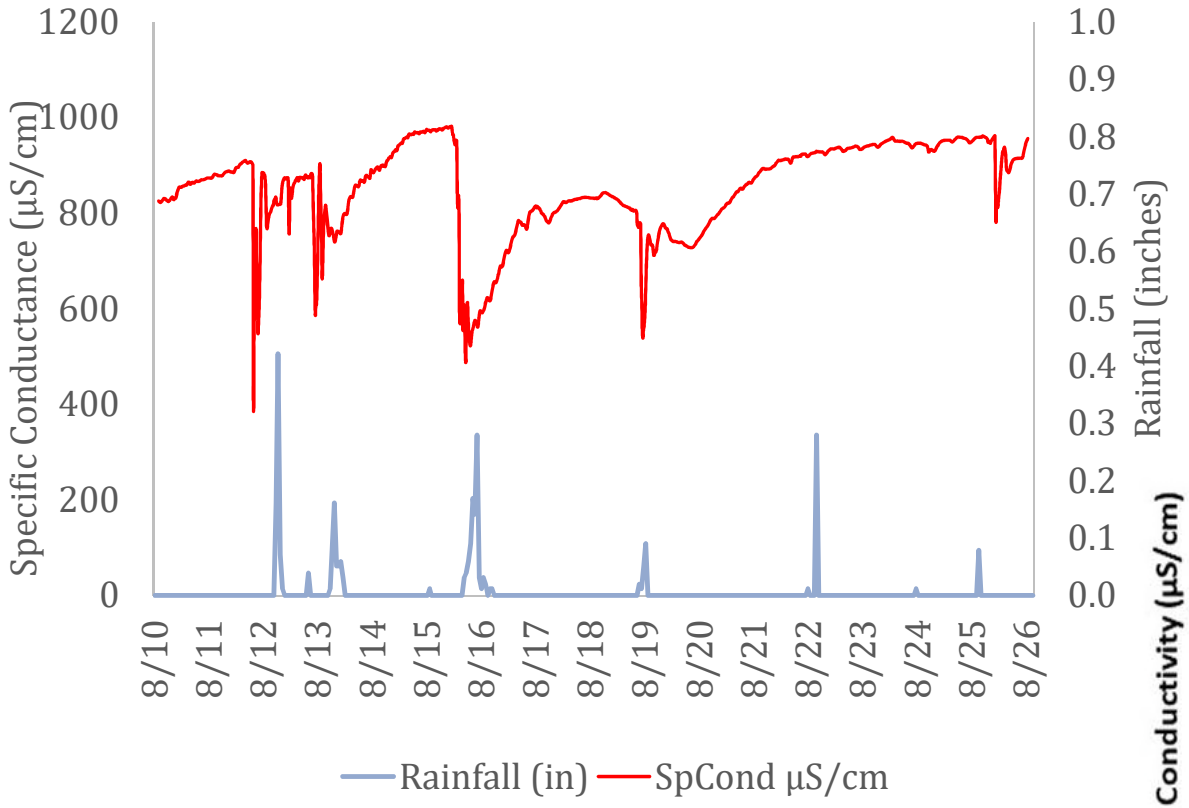
Turbidity

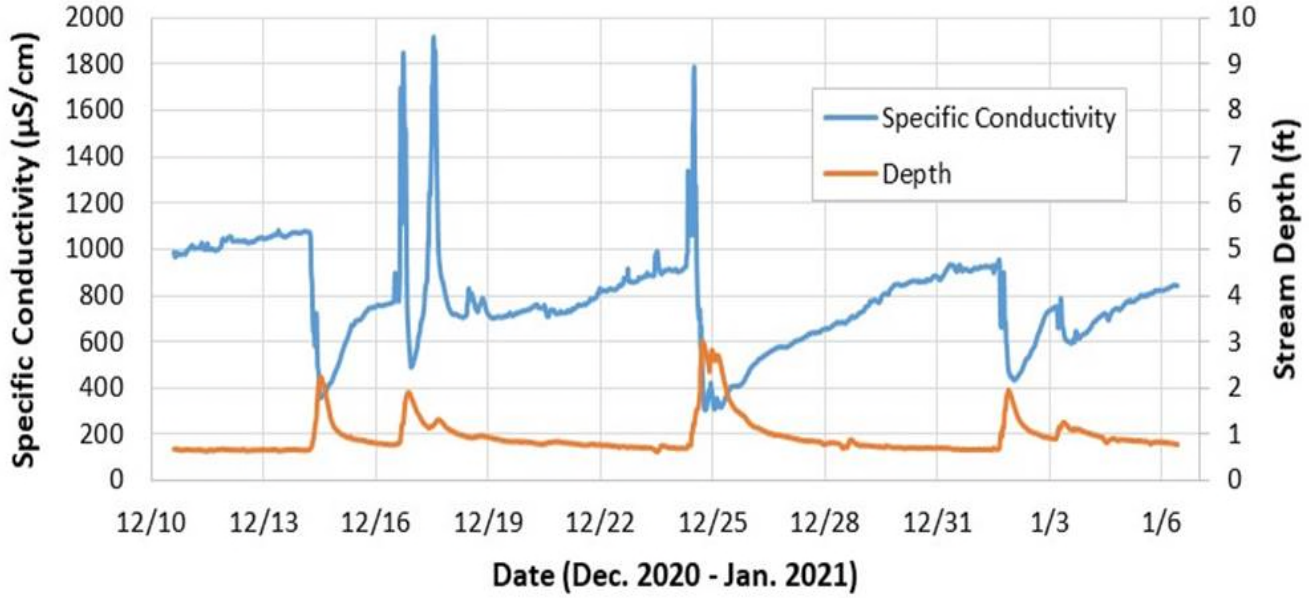

Turbidity (FNU)
200
180
160
140
120
100
80
60
40
20
0
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
Rainfall (inches)
Rainfall (in)
Turbidity (FNU)
8/10
8/11
8/12
8/13
8/14
8/15
8/16
8/17
8/18
8/19
8/20
8/21
8/22
8/23
8/24
8/25
8/26
Sample Date (Month/Day)

Specific Conductivity

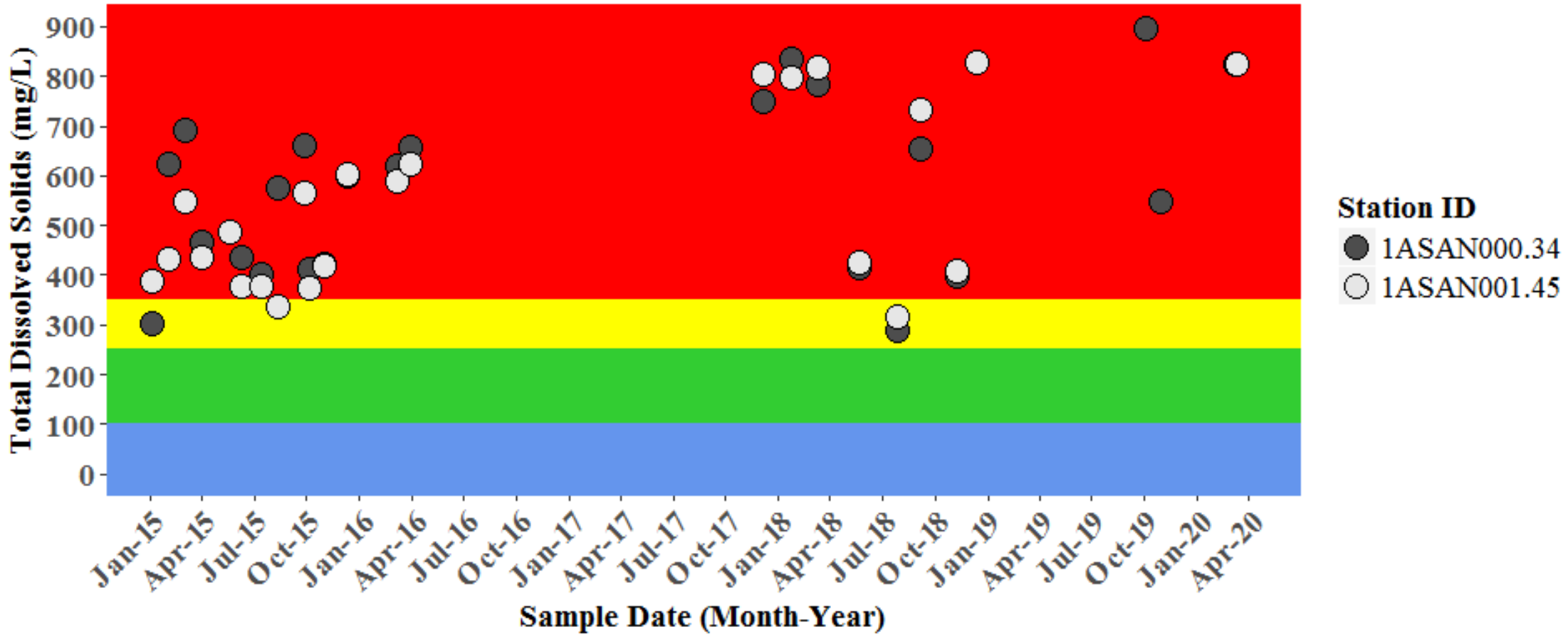


Specific Conductivity (Continuous data)

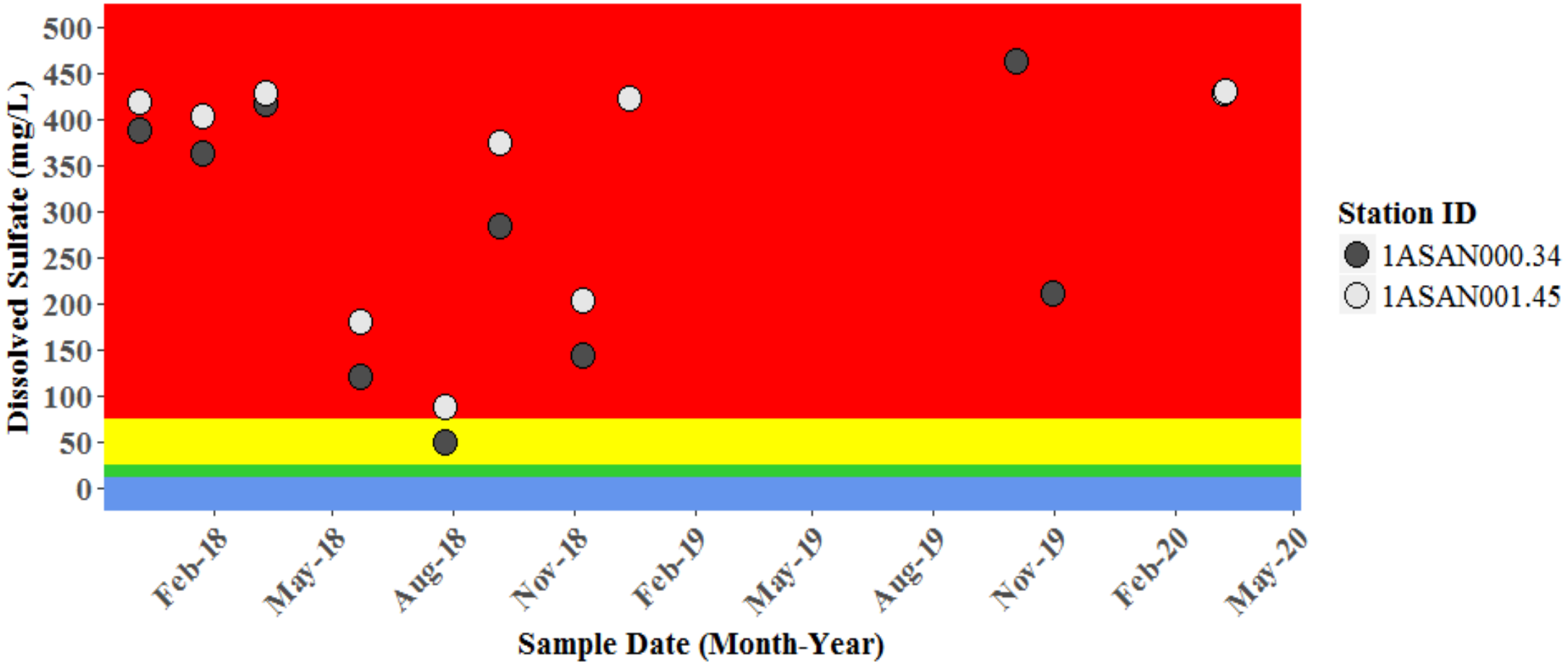




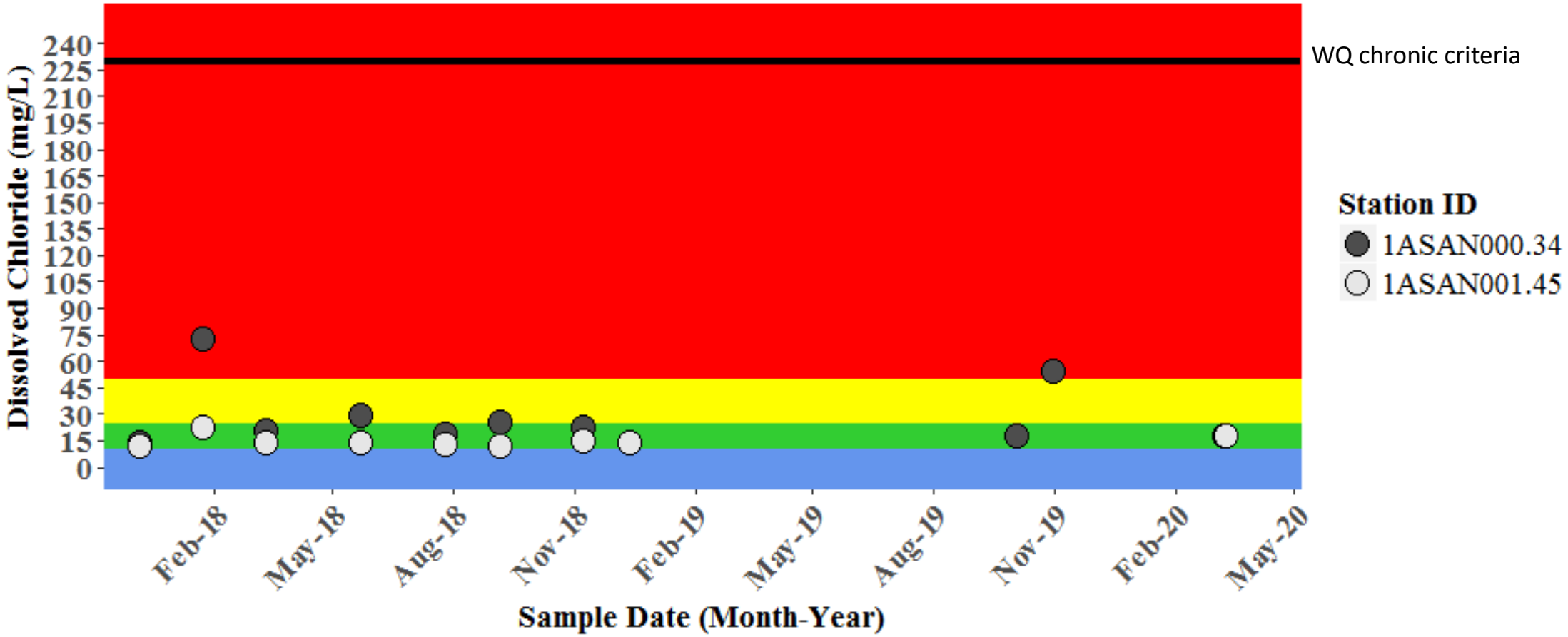
Total Dissolved Solids (TDS)



Dissolved Sulfate



Chloride



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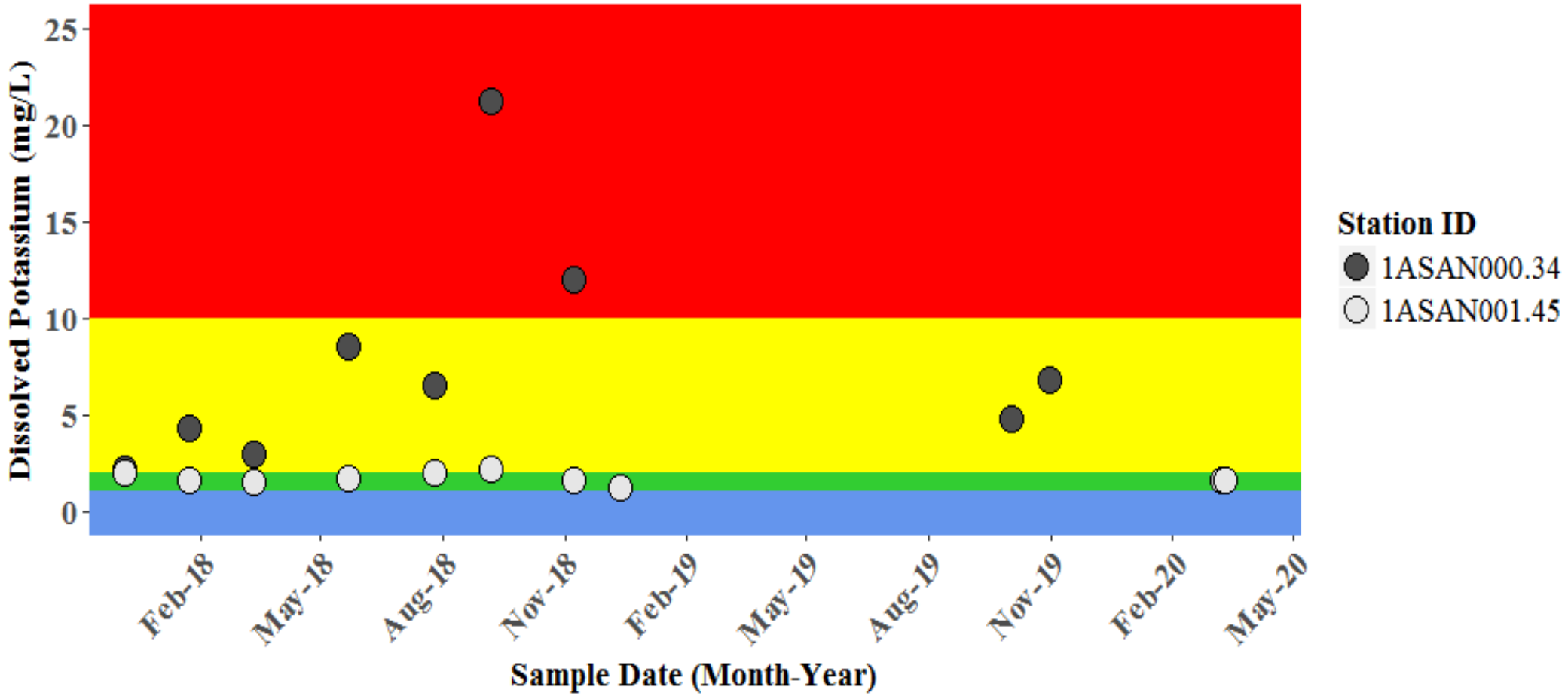
Dissolved Potassium



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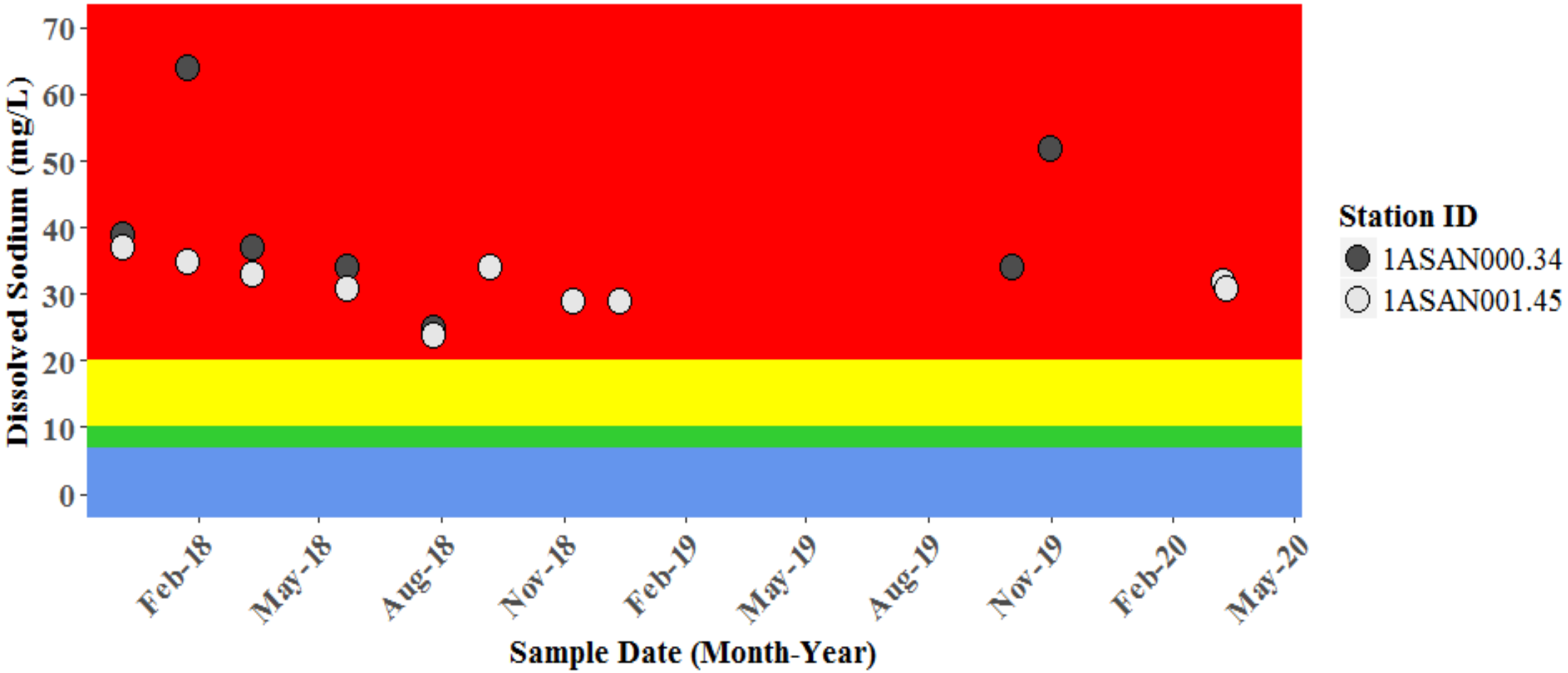
Dissolved Sodium



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Comparison of Dissolved Metals to WQS

Monitoring Location	Parameter / Sample Exceedance of WQS (Y/N)								
	As	Cd	Cr[2]	Cu	Pb	Ni	Se	Ag	Zn
1ASAN000.34[1]	No	No	No	No	No	No	No	No	No

[1] Results based upon 3 sample events: October 3, 2019, October 31, 2019 and September 17, 2020

[2] Chromium was measured as total dissolved with no distinction among the valent forms, Cr III and Cr VI.

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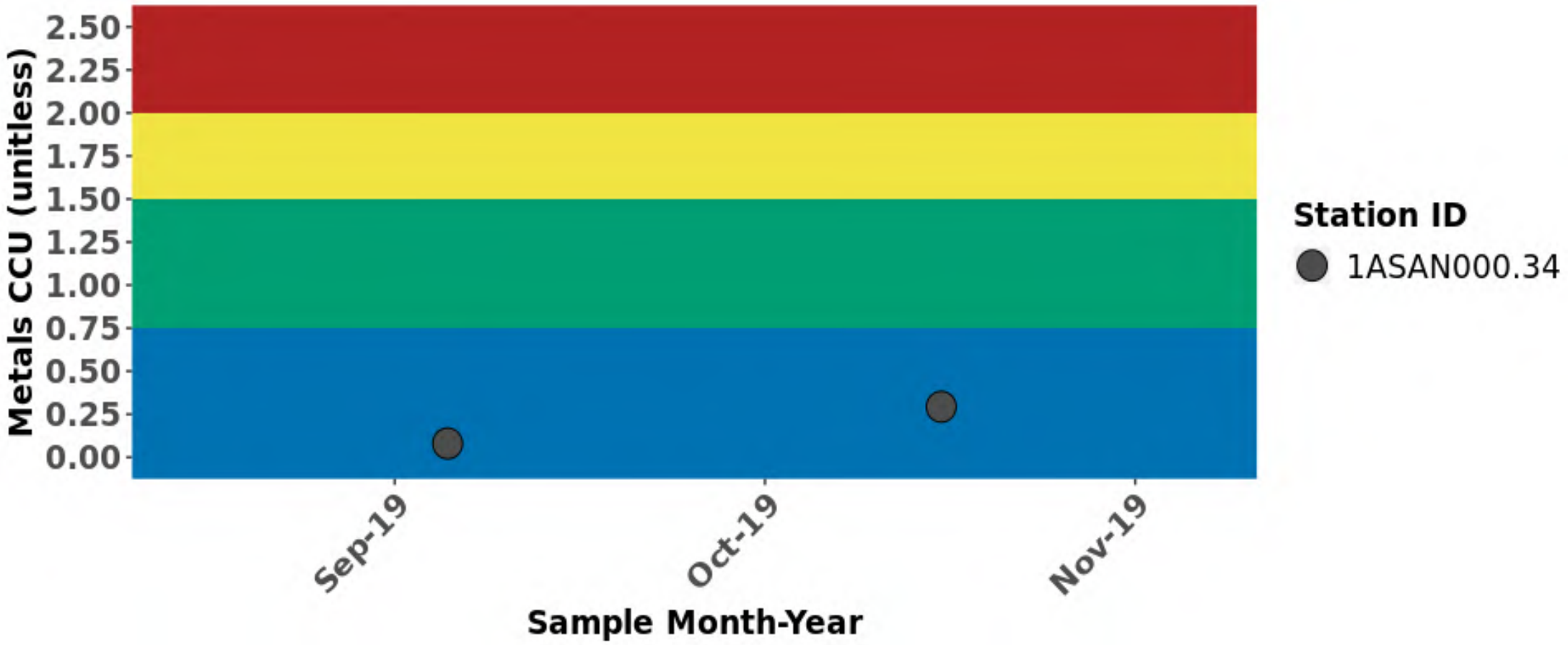
Metals Cumulative Criteria Unit (CCU)



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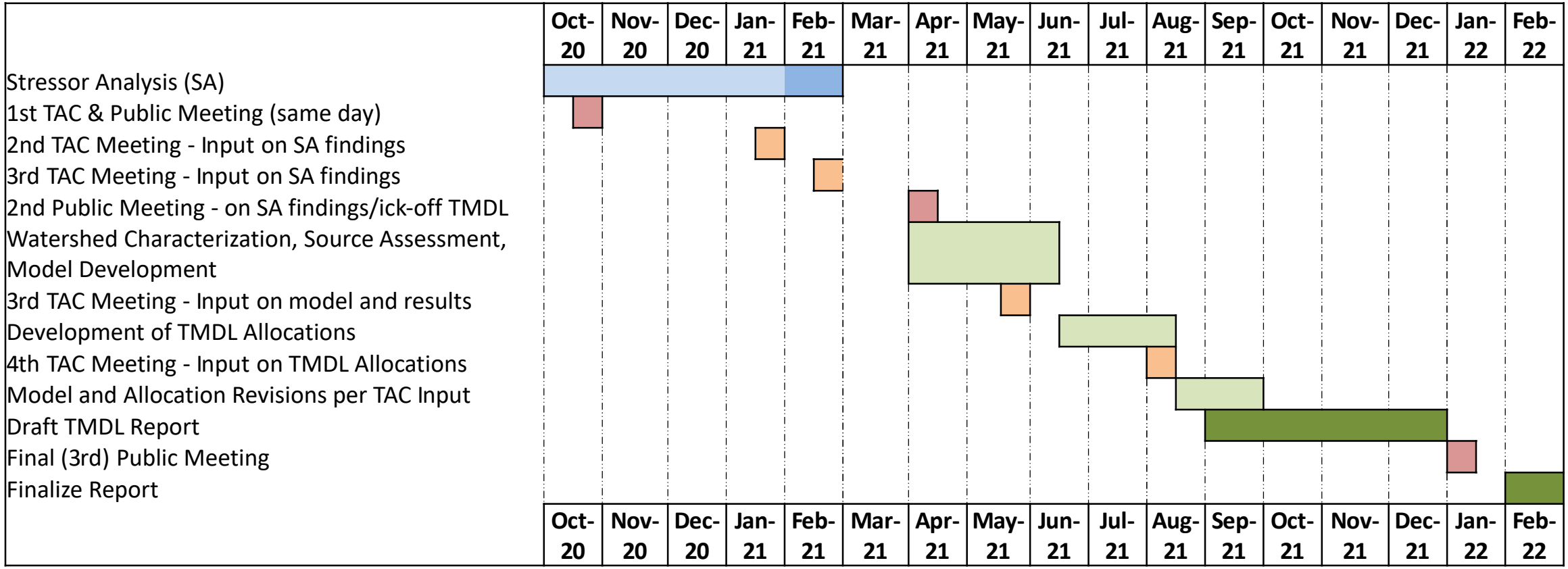
Discussion

Questions?

- Any supplemental information / data to consider?

Project Timeline



Next Steps

- Schedule/Hold 3rd TAC meeting
  - Finish sharing information on stressor analysis (e.g. biological data analysis, CADDIS)
- Complete Stressor Analysis Report per TAC input
- Plan/hold Public Meeting (early April)
  - Finalize Stressor Analysis
  - Kick-off TMDL development

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Meeting Feedback

- Questions or Comments:
  - Sarah Sivers: (703) 583-3898 or Sarah.Sivers@deq.virginia.gov
- Meeting Feedback:
  - Virtual Meeting Public Comment Form (shared by email)
  - Submit to FOIA Board, external to DEQ

Authorized Dischargers

Permit Number	Facility Name	Permit Type
VAR040067	Loudoun County	Municipal Separate Storm Sewer System (MS4) Permit
VA0091430	Loudoun Composting	VPDES IP
VAG110089	Virginia Concrete Company Inc. - Chantilly Plant	Concrete Products GP
VAG110318	Aggregate Industries MAR - Chantilly	Concrete Products GP
VAG110094	Superior Concrete - Dulles	Concrete Products GP
VAG840106	Chantilly Crushed Stone Incorporated	Nonmetallic Mineral Mining GP
VAG406265	Chantilly Liberty	Domestic Sewage GP
VAR052245	William A Hazel Incorporated - Recycling Facility	Stormwater Industrial GP
VAR050863	Virginia Paving Company - Chantilly Plant	Stormwater Industrial GP