Dodge Creek at Portville, NY

NYSDEC SMAS

2021-10-01

# General

Dodge Creek in Portville, NY receives discharge from the Portville Sewage Treatment Plant (STP). Dodge Creek (PWLID 0201-0065) is a Class C stream in the Allegheny River watershed. The Bureau of Water Resource Management requested that the Stream Monitoring and Assessment Section (SMAS) conduct monitoring to determine if potential impacts to aquatic life and water quality were occurring due to the STP discharge (RAS QAPP, 2021 ). Upstream and downstream sampling locations were selected to isolate impacts to aquatic life and determine whether significant reduction in ammonia limits may be required as part of upgrades to the STP. Biological impairment criteria sampling (Bode et al. 1995) was conducted along with collection of information on physical habitat, substrate information, and water chemistry.,

The Dodge Creek at Portville, NY site descriptions (Table ) and locations (Figure ) are included below. Measures of water and habitat quality included:

1. Water Chemistry and Stream Discharge
2. Benthic Macroinvertebrate Community
3. Stream Reach Physical Habitat Characteristics
4. Observer Ranking of Recreational Ability

This data report includes two sections: I) an overview of the sampling events described above, and II) a site-specific data summary to present all major findings for each site. Additional sections (III, IV) include literature cited and appendices covering all references and additional source material.

Table : Sampling locations. Locations are ordered from upstream to downstream according to river mile and mainstem confluence

| **Location ID** | **Group** | **Rivermile** | **WI/PWL** | **Waterbody   Classification** | **Description** | **Latitude** | **Longitude** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 02-DODG-0.3 | upstream | 0.3 | 0201-0065 | C | 40 M BELOW RT. 417 BRIDGE. | 42.036200 | -78.339300 |
| 02-DODG-0.1 | downstream | 0.1 | 0201-0065 | C | DOWSTREAM OF OUTFALL 50M | 42.035795999999998 | -78.34299 |



Figure : Map of sampling locations. Site names reference the Location ID and River Mile.

Table : Sampling dates and overall parameters for the study period included in this report.

| **Site** | **Date** | **Chemistry** | **Macroinvertebrates** |
| --- | --- | --- | --- |
| 02-DODG-0.1 | 2021-07-01 | X | X |
| 02-DODG-0.3 | 2021-07-01 | X | X |

# Benthic Macroinvertebrate Community

Benthic macroinvertebrate communities were sampled to evaluate water quality impacts to the aquatic life use. Where appropriate riffle habitat was present, collection of macroinvertebrates was preformed using the kick method described in section 9.4 of SOP #208-21 Biological Monitoring of Surface Waters in New York State. With the exception of PEERS sites, replicate (n=4/site) macroinvertebrate samples were collected once at each site during years water chemistries were collected. For traveling kick samples, the contents of replicates for each site were field-inspected to determine major groups of organisms present, and then preserved in alcohol for lab inspection and identification of 100-specimen subsamples. For non-wadable sites, multiplates were deployed for a five-week colonization period, scraped, contents preserved and processed to a minimum of 250 organisms and a quarter of the sample. If target counts were not met, samples were processed in their entirety. Specimens were identified to lowest possible taxonomic resolution, typically genus or species.

Biological assessments of water quality are generated from Biological Assessment Profile (BAP) scores (SOP #208-19). BAP scores are calculated by taking the average of five normalized 10-scale community metrics and assigning that score to a four-tiered system of impact category of non (7.5-10), slight (5.0-7.5), moderate (2.5-5.0), or severe (0-2.5) impacts see (Figure; SOP #208-21). A final BAP score below 5 suggests that the sampled stream is not achieving its aquatic life use goals. A BAP score above 5 indicates that the sampled stream is attaining its aquatic life use goals (Figure ). Expected variability in the results of benthic macroinvertebrate community samples is presented in Smith and Bode (2004).

![](data:application/octet-stream;base64,)

Figure : Biological Assessment Profile (BAP) score impact categories based on the macroinvertebrate community. Scores below 5 suggest impairment to aquatic life and scores above 5 indicate attainment of aquatic life of use.

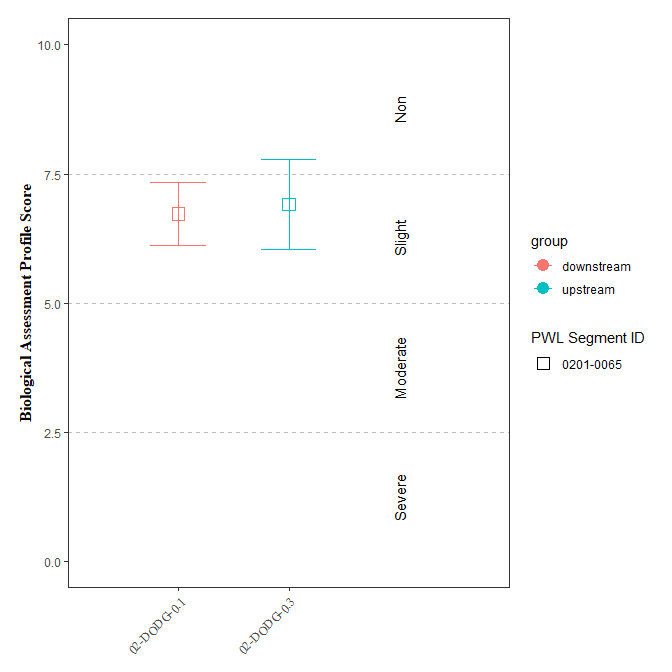


Figure : Biological Assessment Profile (BAP) Scores and 95% confidence intervals for benthic macroinvertebrate community assessment data for the Survey, 2019. Symbology corresponds with WI/PWL segmentation as indicated in the plot legend.

On average, Biological Assessment Profile (BAP) scores indicated from slightly ipacted conditions across sites (SOP #208-19). No segments fell below a mean BAP score of 5 for the study period. (Figure). None of the segments had a mean BAP score that would suggest inconclusive results.

# Biological Impairment Criteria

Biological assessment based on the macroinvertebrate community provide the ability to detect water quality problems that are intermittent, not detected, and/or underestimated by water chemistry sampling. Using biological sampling methods described above (SOP #208-21), criteria have been established for measuring significant biological impairment to resident aquatic life in flowing waters (Bode et al. 1995). Using conditions upstream of a point source rather than reference condition (BAP >5.0) generate site-specific criteria and evaluates potential localized change in the macroinvertebrate community condition.

To isolate water quality as the driver of potential impact to the macroinvertebrate community, several habitat features must be measured at both sampling locations and fall within documented habitat similarity requirements (Bode et al. 1995). These habitat features are routinely collected as part of macroinvertebrate community sampling (SOP #208-21) and include: substrate particle size (within 3 phi units), along with current speed, embeddedness, and canopy cover (all within 50%).

Table : Habitat variable information collected at Dodge Creek (July 1, 2021) to evaluate potential influence of physical habitat on the macroinvertebrate community.

|  | **Phi Units** | **Current (cm/s)** | **% Embeddedness** | **% Canopy** |
| --- | --- | --- | --- | --- |
| 02-DODG-0.3 (Upstream) | -4.2 | 70 | 20 | 0 |
| 02-DODG-0.1 (Downstream) | -3.8 | 70 | 30 | 0 |

*Determination of Significant Biological Impairment*

Significant biological impairment occurs when 1 or more of the biological metrics levels exceed the criteria for impairment designated in Table 4. If the mean of one or more biological metrics exceeds the criteria, a Student’s T test is run to determine statistical significance and confirm significant biological impairment. Biological metrics include Species Richness, Ephemeroptera, Plecoptera, Trichoptera, (EPT) Richness, Biotic Index, Species Dominance, Percent Model Affinity, and BAP. Table 4 indicates no exceedances of biological impairment criteria.

Table : Sampling locations, replicate metric values and means, impairment criteria thresholds for means, and indication of biological impairment criteria exceedance.

|  | **Sample** | **Species Richness** | **EPT Richness** | **Biotic Index** | **Species Dominance** | **Percent Model Affinity** | **BAP** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 02-DODG-0.3 (Upstream) | Rep 1 | 22 | 10 | 4.82 | 10 | 89 | 7 |
|  | Rep 2 | 25 | 9 | 5.21 | 9 | 73 | 6.53 |
|  | Rep 3 | 27 | 9 | 5.01 | 19 | 77 | 6.65 |
| Mean |  | 24.7 | 9 | 5.11 | 12.7 | 75 | 6.59 |
| 02-DODG-0.1 (Downstream) | Rep 1 | 20 | 9 | 4.22 | 14 | 77 | 7.12 |
|  | Rep 2 | 21 | 8 | 4.35 | 23 | 60 | 6.51 |
|  | Rep 3 | 27 | 10 | 4.87 | 17 | 72 | 7.11 |
| Mean |  | 22.7 | 9 | 4.48 | 18 | 70 | 6.91 |
| Net change (Difference of Upstream from Downstream) |  | -2 | 0 | -0.63 | 5.33 | -5 | 0.32 |
| Criteria for Impairment |  | -8 | -4 | 1.5 | 15 | -20 | -1.5 |
| Exceedance (Y or N) |  | N | N | N | N | N | N |

# Water Chemistry and Stream Discharge

### Water Chemistry Methodology

Methods used for water chemistry data collection are described by NYSDEC standard operating procedures (SOP). The collection of water chemistry samples followed procedures described in SOP #210(21) Collection of Water Column Samples for the Rotating Integrated Basin Studies (RIBS) Program. Where the depth of water permitted, water chemistry samples were collected using the depth-integrating suspended water quality sampler – wading (DH-81) method (SOP #210(21)), section 11.2). Where the depth of water was too shallow water chemistry samples were collected using the direct grab method (SOP #210(¬21), section 11.6). Water samples were processed using a contract lab with NYS Environmental Laboratory Approval Program (ELAP) certification.

Ambient water chemistry sampling included in situ and lab measured water quality analytes (Table). Where applicable, chemistry results were analyzed for violations of state water quality standards and summarized below using R programing software (R Core Team, 2017). All raw chemistry results (in situ and lab reported) with all applicable standards and violation determinations accompany this report as Attachment I (excel file).

All survey data were subjected to the quality assurance/quality control (QA/QC) protocols detailed in the handling and validation SOPs (SOP #102-20, and #110-21). Only data meeting the highest data quality standard are reported and used in this report. For water chemistry, an evaluation of the precision, accuracy, and completeness of processed water chemistry samples after lab analyses were performed following the methods detailed in SOP #102. Appendix IV includes a compilation of all rejected data flagged by the process. All accepted raw chemistry results (in situ and lab reported) with all applicable standards and violation determinations accompany this report as Attachment I (excel file). Analytes that fell below the minimum detection limit (MDL) were replaced with 1/2 the MDL (reference).

Stream discharge was measured using the velocity-area method according to Turnipseed and Sauer (2010). The velocity-area method (Midsection Method) calculates discharge by subdividing a stream cross-section into 10 equally spaced stations and measuring depth and velocity within each station and summing the products (Turnipseed and Sauer, 2010). A top-set wading rod and Sontek FlowTracker was used. Methods are described in detail in Turnipseed and Sauer (2010) and Appendix I provides pertinent elements. Appendix II provides the field sheet used in collection of stream depth and velocity for discharge calculations.

### Violations of Water Quality Standards

A total of 22 lab-measured, and 4 in situ water quality analytes were analyzed and out of the 43 lab-measured records and 8 in situ water quality records, there were 0 violation(s) of established water quality standards (6 NYCRR Part 703). .

Plots illustrating select analyte concentrations are included in this report.Analytes selected for presentation were subset to those of specific interest to the study and include Nitrate, N-Nitrate + Nitrite, Nitrite, Total Nitrogen, Ammonia, Total Kjeldahl Nitrogen (TKN), Total Phosphorus, and Turbidity, and in situ parameters: Dissolved Oxygen, Temperature, pH, and Specific Conductance. To provide context, each figure contains lines representing the 25th, 75th, and 95th percentiles of each analyte collected statewide by SMAS from 2001 to 2019. Violations (if applicable) are indicated by an asterisk. Site specific Violations are quantified in Section II.

Table : Water chemistry analytes sampled as part of the Stream Assessment Survey. Table lists sampled analytes and analytical specifications. ^ Precision objectives are defined by results of duplicate samples as described in Appendix V

| **Analytes** | **Analytical  Lab** | **Method** | **Precision** | **Accuracy** | **Calibration:   Initial** | **Calibration:   Ongoing** | **Calibration:   Blanks** | **Detection   Limit** | **Reporting   Limit** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Alkalinity | ALS | SM 2320B | ^ | ± 20% | Daily | Every 10 | Every 10 | 1.0 mg/L | 2.0 mg/L |
| Aluminum (total) | ALS | EPA 200.8 | ^ | ± 20% | Daily | Every 10 | Every 10 | 4.0 µ/L | 50 µ/L |
| Arsenic (total) | ALS | EPA 200.8 | ^ | ± 20% | Daily | Every 10 | Every 10 | 0.3 µ/L | 1 µ/L |
| Cadmium (total) | ALS | EPA 200.8 | ^ | ± 20% | Daily | Every 10 | Every 10 | 0.03 µ/L | 1 µ/L |
| Calcium | ALS | EPA 200.7 | ^ | ± 20% | Daily | Every 10 | Every 10 | 0.1 mg/L | 1.0 mg/L |
| Chloride | ALS | EPA 300.0 | ^ | ± 20% | As needed | Every 10 | Every 10 | 0.02 mg/L | 0.2 mg/L |
| Copper (total) | ALS | EPA 200.8 | ^ | ± 20% | Daily | Every 10 | Every 10 | 0.04 µ/L | 1 µ/L |
| Hardness | ALS | SM 2340C | ^ | ± 20% | Daily | Every 10 | Every 10 | 0.3 mg/L | 2.0 mg/L |
| Iron (total) | ALS | EPA 200.7 | ^ | ± 20% | Daily | Every 10 | Every 10 | 6 µ/L | 100 µ/L |
| Lead (total) | ALS | EPA 200.8 | ^ | ± 20% | Daily | Every 10 | Every 10 | 0.08 µ/L | 1 µ/L |
| Magnesium | ALS | EPA 200.7 | ^ | ± 20% | Daily | Every 10 | Every 10 | 0.04 mg/L | 1.0 mg/L |
| Nickel (total) | ALS | EPA 200.8 | ^ | ± 20% | Daily | Every 10 | Every 10 | 0.04 µ/L | 1 µ/L |
| Ammonia | ALS | D6919-09 | ^ | ± 20% | As needed | Every 10 | Every 10 | 0.008 mg/L | 0.01 mg/L |
| Total Kjeldahl Nitrogen | ALS | EPA 351.2 | ^ | ± 20% | Daily | Every 10 | Every 10 | 0.08 mg/L | 0.1 mg/L |
| Nitrate-nitrite | ALS | Calculated | ^ |  |  |  |  |  |  |
| Nitrogen, Nitrate | ALS | EPA 353.2 | ^ | ± 20% | Daily | Every 10 | Every 10 | 0.02 mg/L | 0.05 mg/L |
| Nitrogen, Nitrite | ALS | EPA 351.2 | ^ | ± 20% | Daily | Every 10 | Every 10 | 0.08 mg/L | 0.1 mg/L |
| Nitrogen, Total | ALS | Calculated | ^ |  |  |  |  |  |  |
| Total Phosphorus | ALS | EPA 365.1 | ^ | ± 20% | Daily | Every 10 | Every 10 | 0.002 mg/L | 0.003 mg/L |
| Silver (total) | ALS | EPA 200.8 | ^ | ± 20% | Daily | Every 10 | Every 10 | 0.07 µ/L | 1 µ/L |
| Turbidity | ALS | EPA 180.1 | ^ | ± 10% | Daily | Every 10 | Every 10 | 0.06 NTU | 0.1 NTU |
| Zinc (total) | ALS | EPA 200.8 | ^ | ± 20% | Daily | Every 10 | Every 10 | 0.7 µ/L | 10 µ/L |

## Water Chemistry

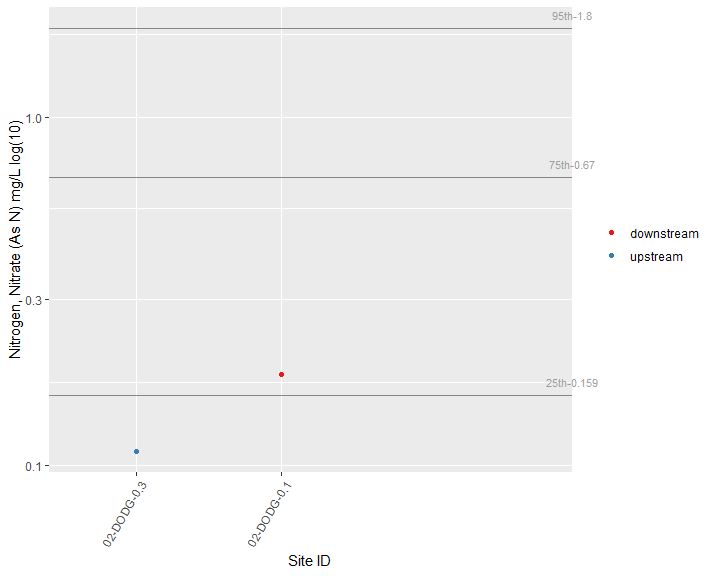


Figure : Nitrogen, Nitrate (As N), Horizontal lines represent the 95th, 75th, and 25th percentiles of statewide data for each endpoint.Stars at the bottom of the graph indicate a violation of a WQS (if applicable). Axis are presented in log scale for comparison by site.

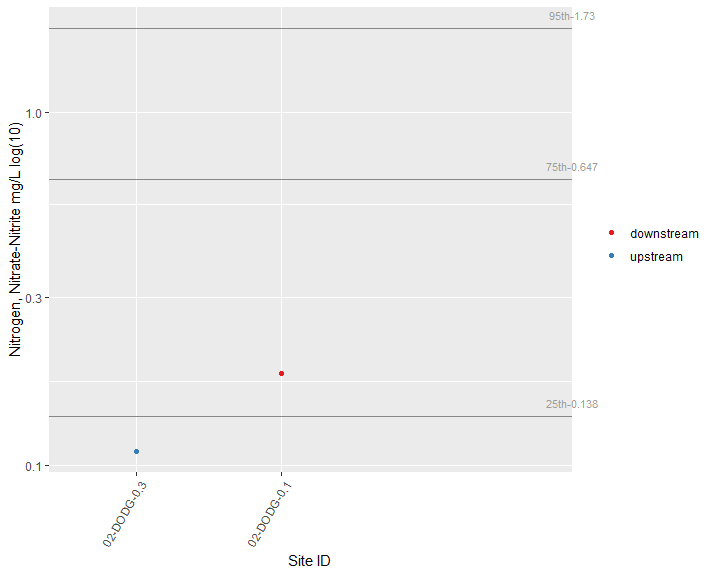


Figure : Nitrogen, Nitrate-Nitrite, Horizontal lines represent the 95th, 75th, and 25th percentiles of statewide data for each endpoint.Stars at the bottom of the graph indicate a violation of a WQS (if applicable). Axis are presented in log scale for comparison by site.

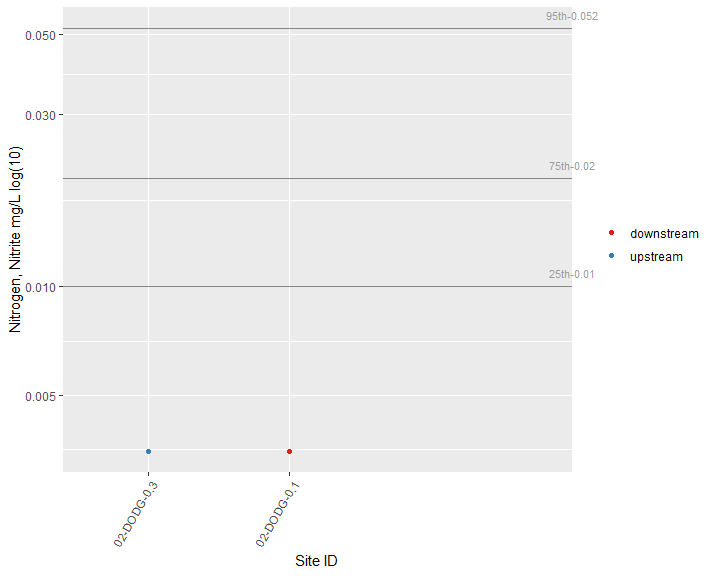


Figure : Nitrogen, Nitrite, Horizontal lines represent the 95th, 75th, and 25th percentiles of statewide data for each endpoint.Stars at the bottom of the graph indicate a violation of a WQS (if applicable). Axis are presented in log scale for comparison by site.

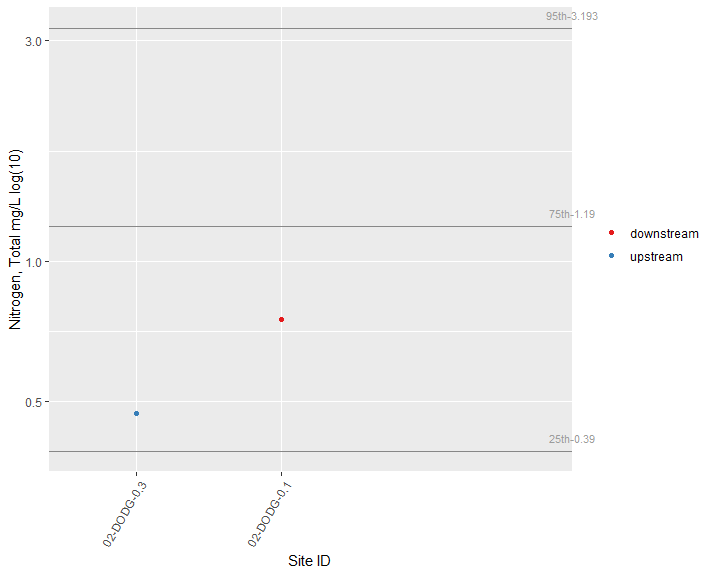


Figure : Nitrogen, Total, Horizontal lines represent the 95th, 75th, and 25th percentiles of statewide data for each endpoint.Stars at the bottom of the graph indicate a violation of a WQS (if applicable). Axis are presented in log scale for comparison by site.

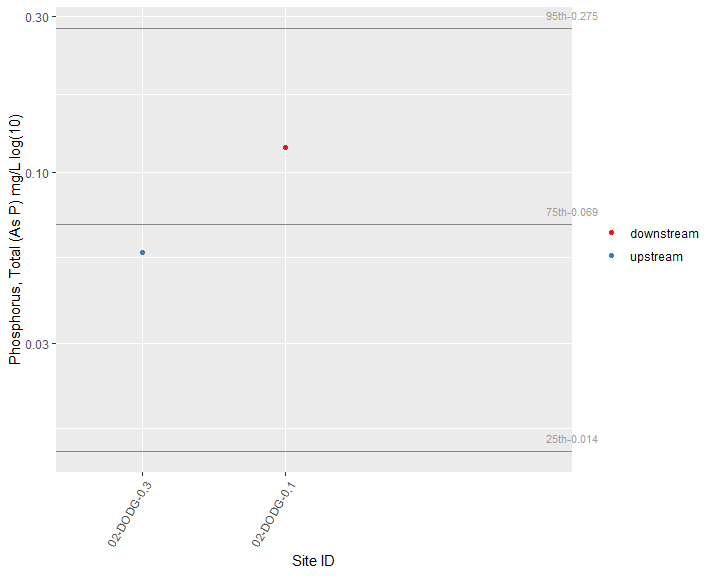


Figure : Phosphorus, Total (As P), Horizontal lines represent the 95th, 75th, and 25th percentiles of statewide data for each endpoint.Stars at the bottom of the graph indicate a violation of a WQS (if applicable). Axis are presented in log scale for comparison by site.

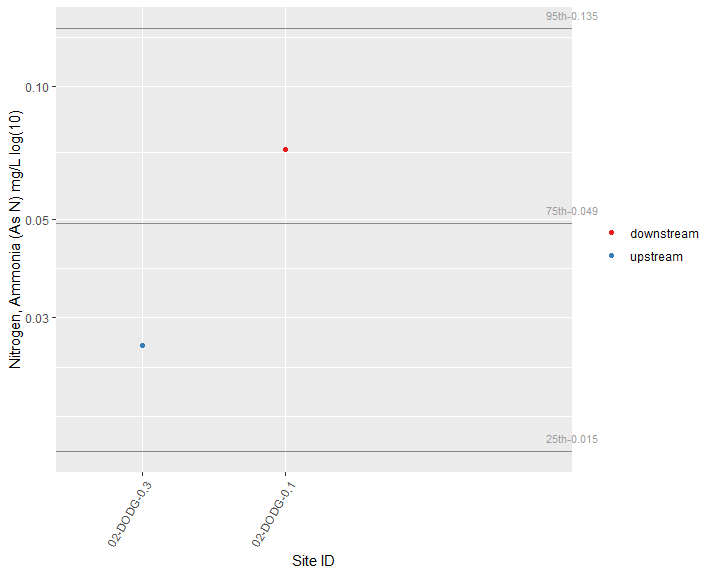


Figure : Nitrogen, Ammonia (As N), Horizontal lines represent the 95th, 75th, and 25th percentiles of statewide data for each endpoint.Stars at the bottom of the graph indicate a violation of a WQS (if applicable). Axis are presented in log scale for comparison by site.

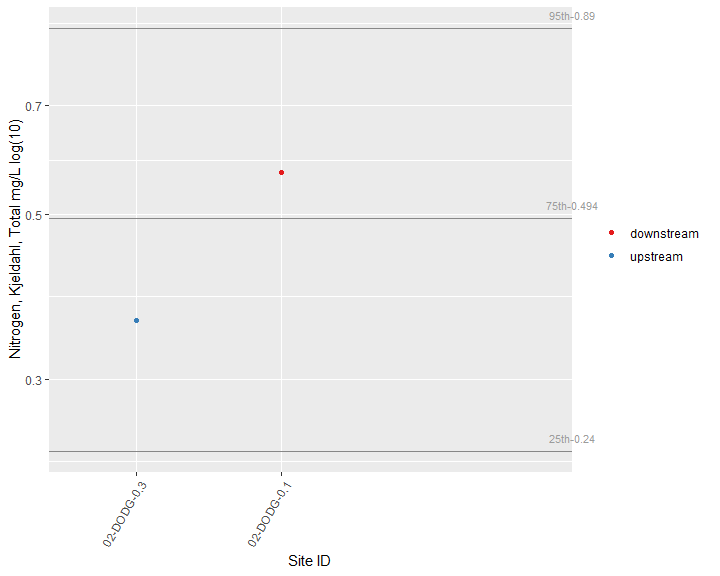


Figure : Nitrogen, Kjeldahl, Total, Horizontal lines represent the 95th, 75th, and 25th percentiles of statewide data for each endpoint.Stars at the bottom of the graph indicate a violation of a WQS (if applicable). Axis are presented in log scale for comparison by site.

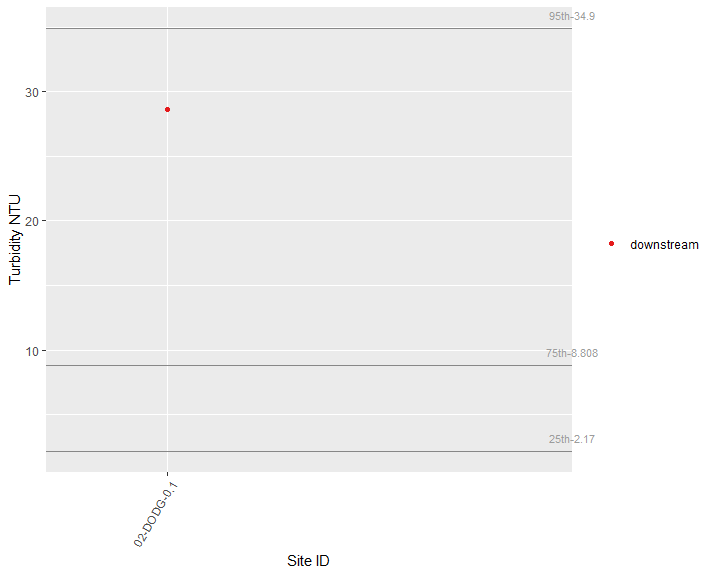


Figure : Turbidity, Horizontal lines represent the 95th, 75th, and 25th percentiles of statewide data for each endpoint.Stars at the bottom of the graph indicate a violation of a WQS (if applicable). Axis are presented in log scale for comparison by site.

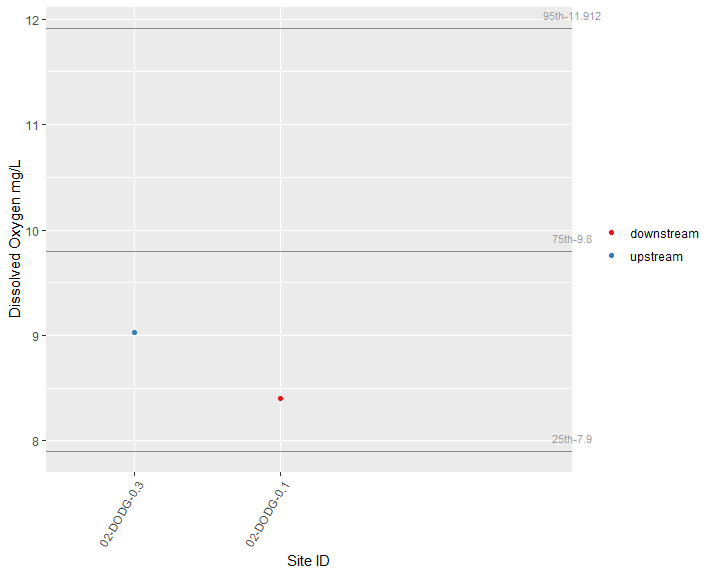


Figure : Dissolved Oxygen, Horizontal lines represent the 95th, 75th, and 25th percentiles of statewide data for each endpoint.Stars at the bottom of the graph indicate a violation of a WQS (if applicable). Axis are presented in log scale for comparison by site.

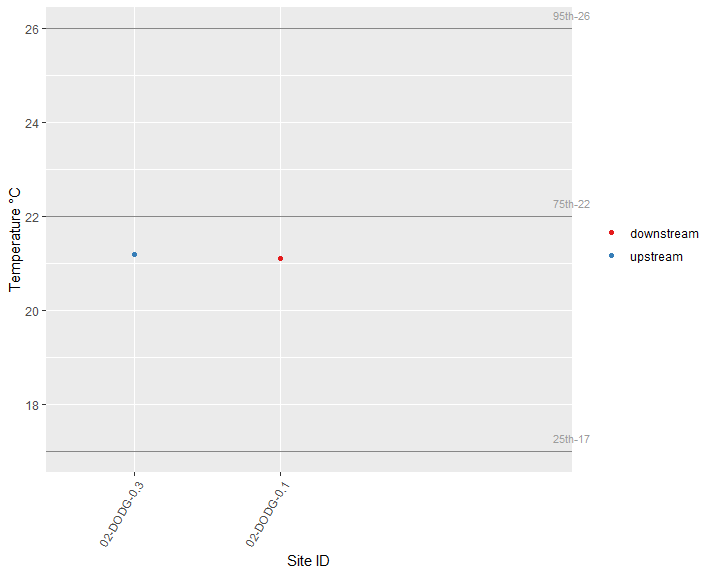


Figure : Temperature, Horizontal lines represent the 95th, 75th, and 25th percentiles of statewide data for each endpoint.Stars at the bottom of the graph indicate a violation of a WQS (if applicable). Axis are presented in log scale for comparison by site.

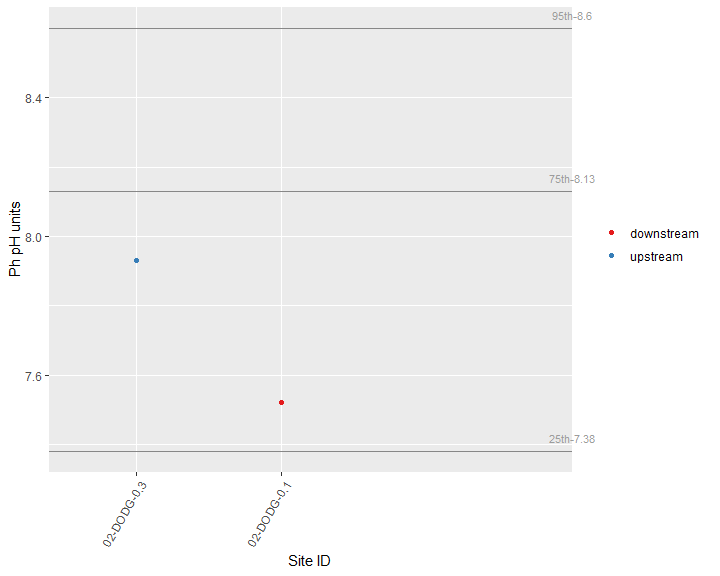


Figure : Ph, Horizontal lines represent the 95th, 75th, and 25th percentiles of statewide data for each endpoint.Stars at the bottom of the graph indicate a violation of a WQS (if applicable). Axis are presented in log scale for comparison by site.

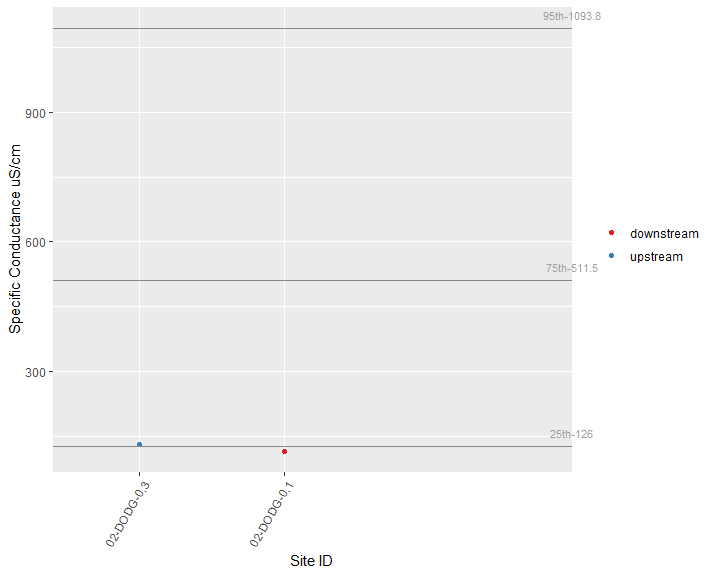


Figure : Specific Conductance, Horizontal lines represent the 95th, 75th, and 25th percentiles of statewide data for each endpoint.Stars at the bottom of the graph indicate a violation of a WQS (if applicable). Axis are presented in log scale for comparison by site.

### Appendix IV. QA/QC Results

The following tables represent all data excluded from the study, or samples that were taken during the study period but flagged for exclusion from reporting by the QA/QC methods described in SOP#110-21.

Table : Water chemistry analytes flagged as R (rejected) and not included in the analysis for the report.

| **Site** | **Date** | **Parameter** | **Units** | **Fraction** | **Result** | **Validated** | **Validator** | **Explanation** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 02-DODG-0.3 | 7/1/2021 | TURBIDITY | NTU | TOTAL | 19.1 | 9/20/2021 | R | Equipment Blank error |