



Clean Air Status and Trends Network

Quarterly Data Summary for Second Quarter 2026 (April through June)

EPA Contract No.: 68HERH21D0006

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Submitted: September 30, 2026

Introduction

This quarterly report summarizes the Clean Air Status and Trends Network (CASTNET) data collected during second quarter 2026. Trends in pollutants measured at eastern and western reference sites are shown. Results from the quality assurance/quality control (QA/QC) program are presented for second quarter data and include completeness and precision of filter concentrations and hourly ozone (O_3) concentrations. This report also analyzes data for continuous, trace-level total reactive oxides of nitrogen (NO_y) from the five sites that were operational during second quarter. Other QC statistics are given in the CASTNET Second Quarter 2026 Quality Assurance Report (WSP, 2026).

Figure 1. Fourth Highest Maximum Daily Average 8-hour O₃ Concentrations (ppb) for 2026 through June 30, 2026

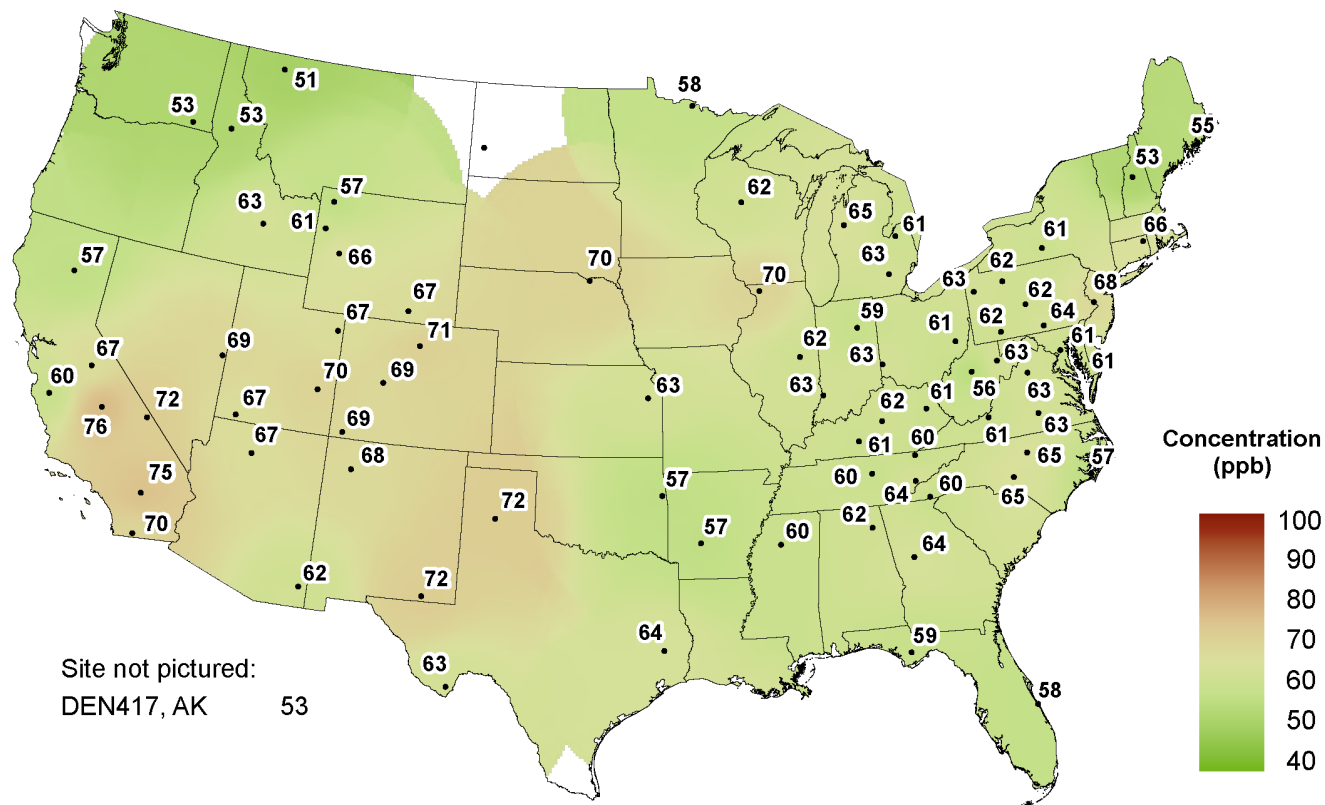


Figure 1 shows fourth highest maximum daily average eight-hour O₃ concentrations (MDA8) in parts per billion (ppb) measured through second quarter 2026. Six sites exceeded the 0.070 parts per million (70 ppb in practice) National Ambient Air Quality Standards for O₃.

Trends

Second Quarter Concentrations

Trend analyses were performed based on filter pack pollutant concentrations measured in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) of air at the 27 eastern and 16 western reference sites during second quarter. Quarterly concentrations of nitric acid (HNO₃), nitrate (NO₃⁻), ammonium (NH₄⁺), total NO₃⁻, sulfate (SO₄²⁻), chloride (Cl⁻), calcium (Ca²⁺), potassium (K⁺), magnesium (Mg²⁺), sodium (Na⁺), and O₃ concentrations were analyzed using box plots. Plots were constructed by averaging valid concentrations for all eastern and western reference sites. The percent change in second quarter mean filter pack concentrations and O₃ concentrations at eastern and western reference sites from 2025 to 2026 are shown in Table 1. Trends in quarterly mean filter pack and O₃ concentrations are shown using box plots in Figures 2 through 12.

Table 1. Percent Change in Concentrations from Second Quarter 2025 to Second Quarter 2026

	O ₃	Total NO ₃ ⁻	NH ₄ ⁺	SO ₄ ²⁻	Ca ²⁺	K ⁺	Mg ²⁺	Na ⁺	Cl ⁻
Eastern	6	4	-8	-6	10	-12	9	25	20
Western	-1	-6	5	-1	-17	-19	-23	-13	-21

Figure 2. Trends in Second Quarter Mean HNO₃ Concentrations

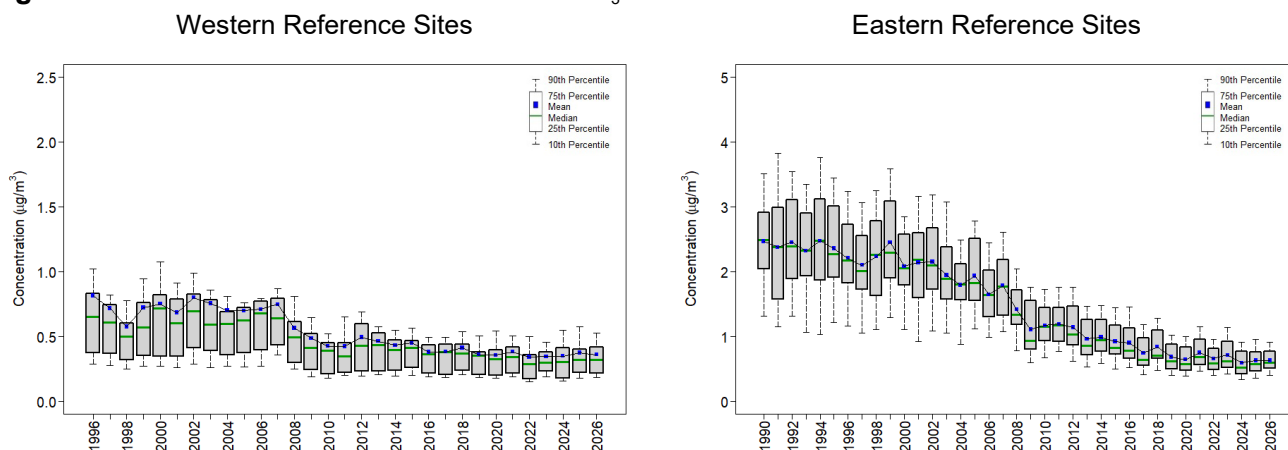
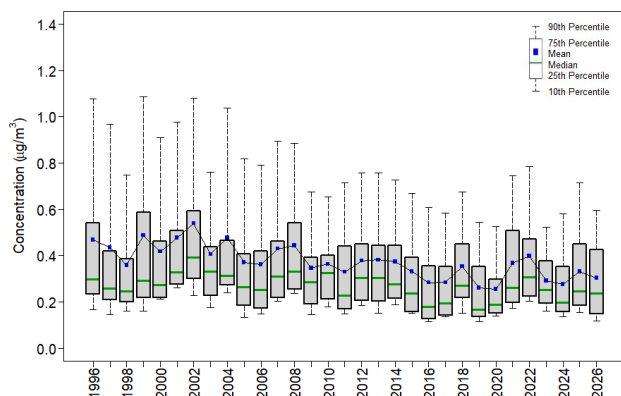


Figure 3. Trends in Second Quarter Mean NO_3^- Concentrations
Western Reference Sites



Eastern Reference Sites

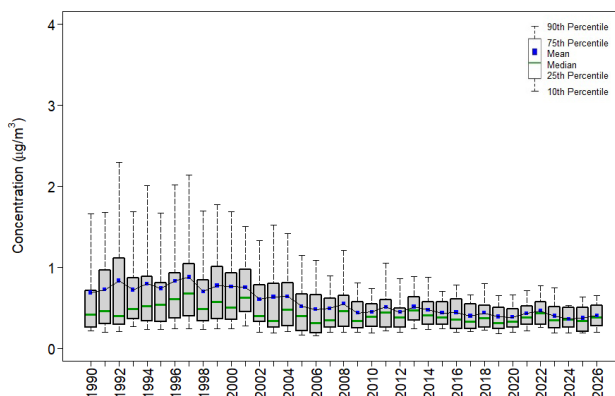
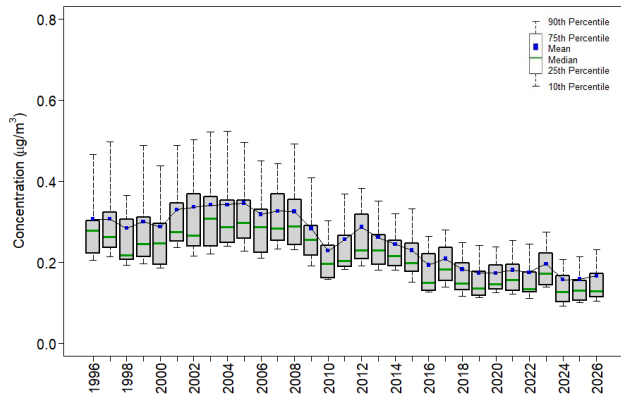


Figure 4. Trends in Second Quarter Mean NH_4^+ Concentrations
Western Reference Sites



Eastern Reference Sites

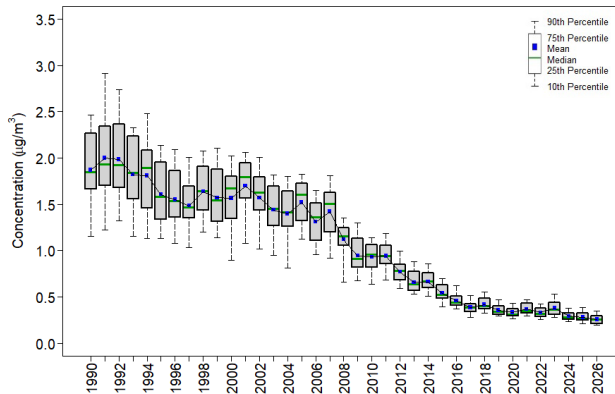
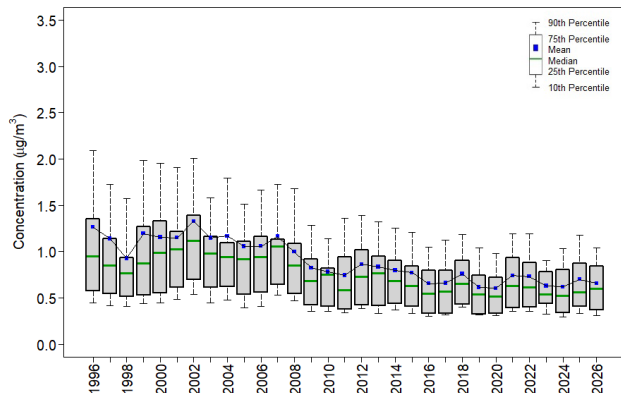


Figure 5. Trends in Second Quarter Mean Total NO_3^- Concentrations
Western Reference Sites



Eastern Reference Sites

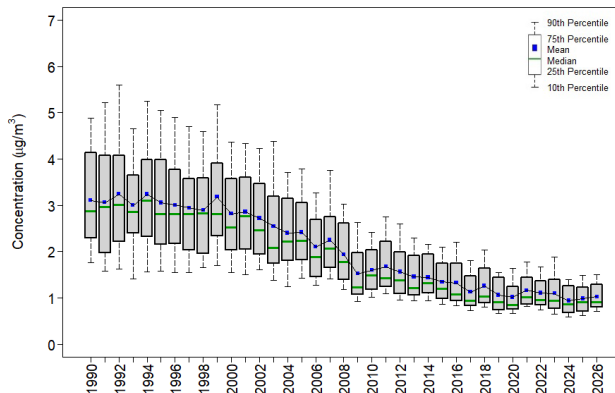
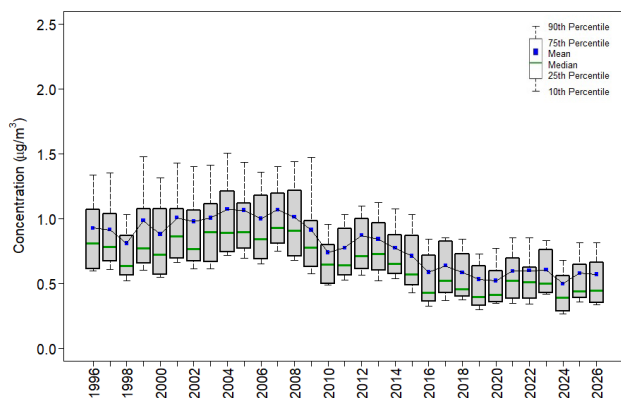


Figure 6. Trends in Second Quarter Mean SO_4^{2-} Concentrations
Western Reference Sites



Eastern Reference Sites

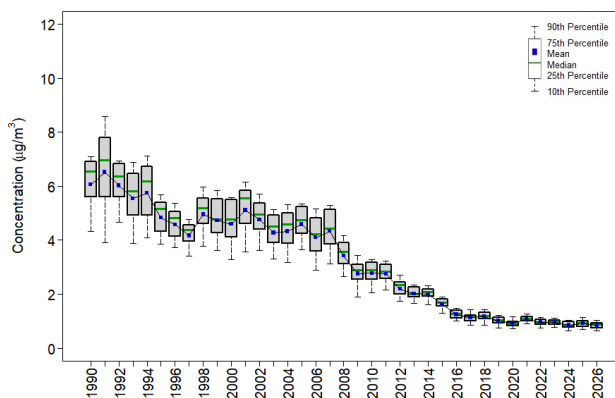
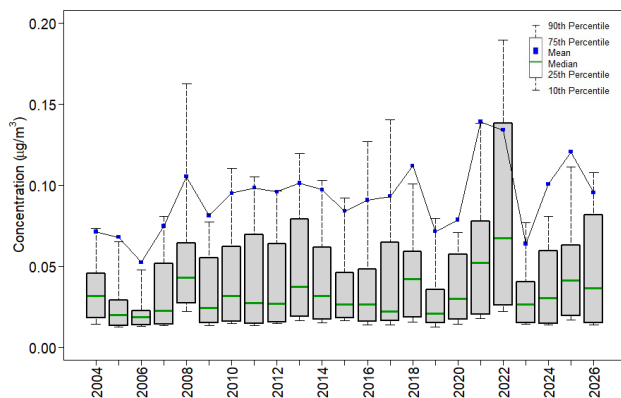


Figure 7. Trends in Second Quarter Mean Cl^- Concentrations
Western Reference Sites



Eastern Reference Sites

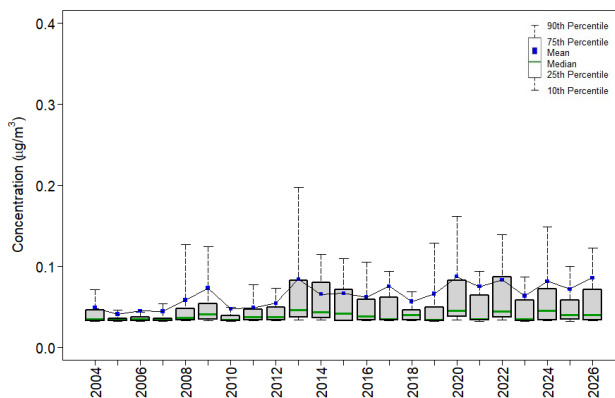
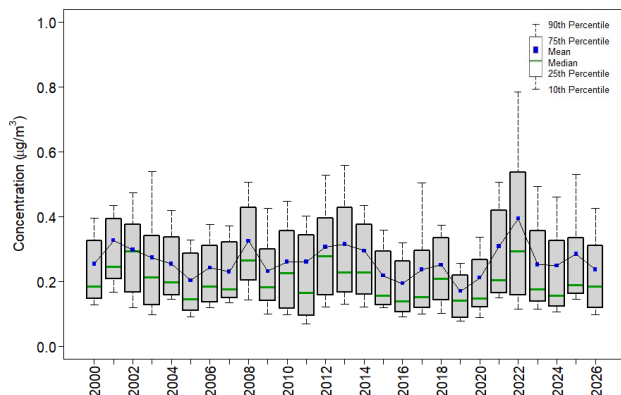


Figure 8. Trends in Second Quarter Mean Ca^{2+} Concentrations
Western Reference Sites



Eastern Reference Sites

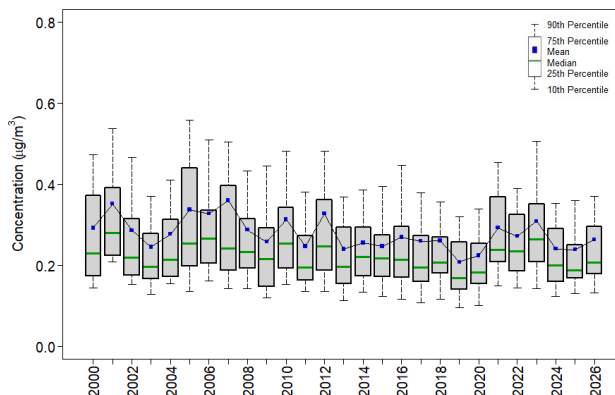
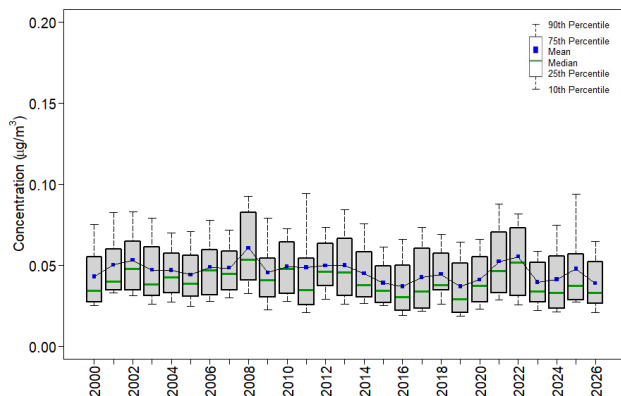


Figure 9. Trends in Second Quarter Mean K^+ Concentrations
Western Reference Sites



Eastern Reference Sites

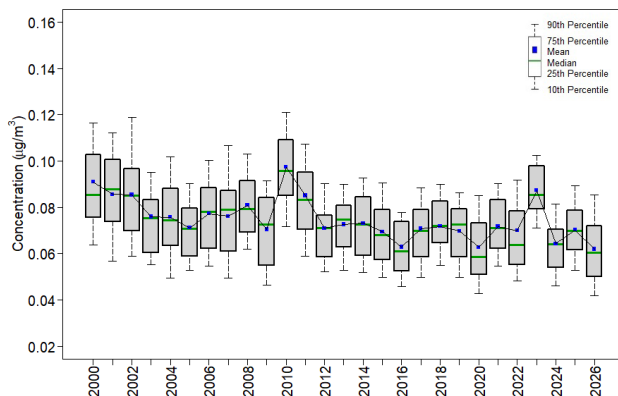
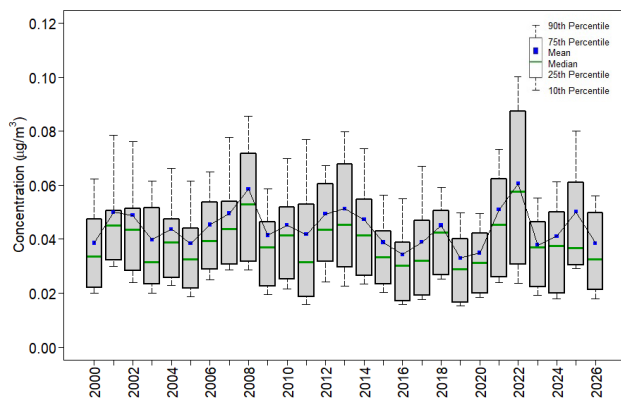


Figure 10. Trends in Second Quarter Mean Mg^{2+} Concentrations
Western Reference Sites



Eastern Reference Sites

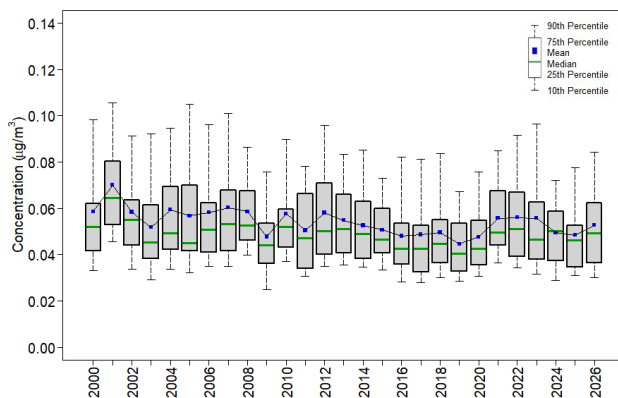
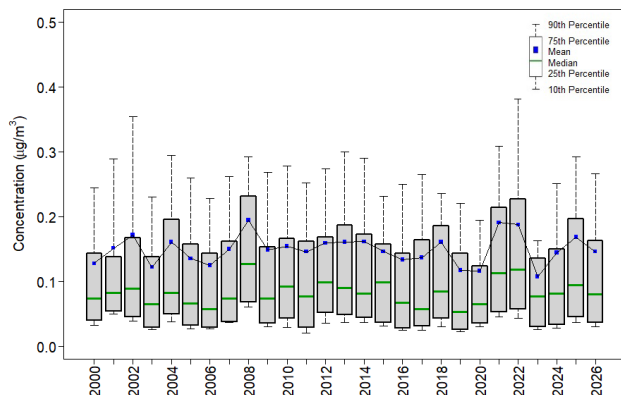


Figure 11. Trends in Second Quarter Mean Na^+ Concentrations
Western Reference Sites



Eastern Reference Sites

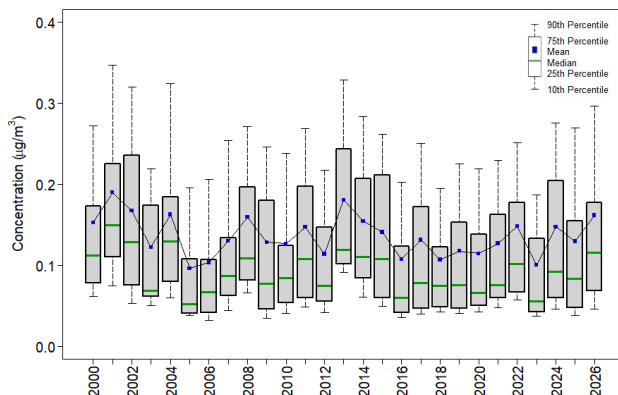
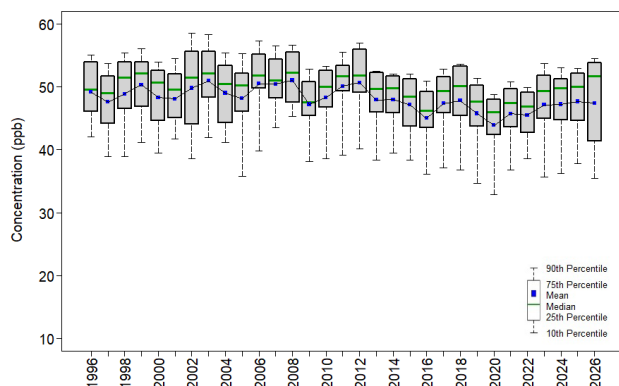
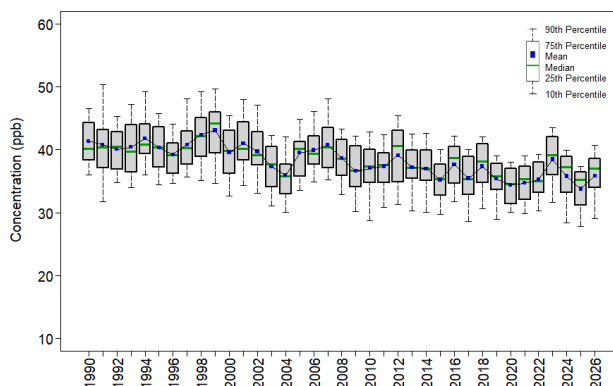


Figure 12. Trends in Second Quarter Mean O₃ Concentrations
Western Reference Sites



Eastern Reference Sites



Changes in Three-Year Average Second Quarter Concentrations

Tables 2 and 3 summarize changes in three-year averages of quarterly mean concentrations of O₃, total NO₃⁻, NH₄⁺, and SO₄²⁻ over the period 1990–1992 and 2024–2026 for the eastern reference sites and 1996–1998 and 2024–2026 for the western reference sites. Changes in Ca²⁺, K⁺, Mg²⁺, Na⁺, and Cl⁻ concentrations are shown from 2004–2006 and 2024–2026.

Table 2. Eastern Reference Sites: Three-Year Mean Values (ppb or µg/m³)

	O ₃ (ppb)	Total NO ₃ ⁻	NH ₄ ⁺	SO ₄ ²⁻	Ca ²⁺	K ⁺	Mg ²⁺	Na ⁺	Cl ⁻
1990–1992	41	3.1	2.0	6.2					
2004–2006					0.31	0.07	0.06	0.12	0.04
2024–2026	35	1.0	0.3	0.9	0.25	0.07	0.05	0.15	0.08
Percent Change	-14	-69	-86	-86	-21	-12	-14	21	78

Note: Ozone concentrations are given as ppb. Concentrations for all other parameters are in µg/m³.

Table 3. Western Reference Sites: Three-Year Mean Values (ppb or µg/m³)

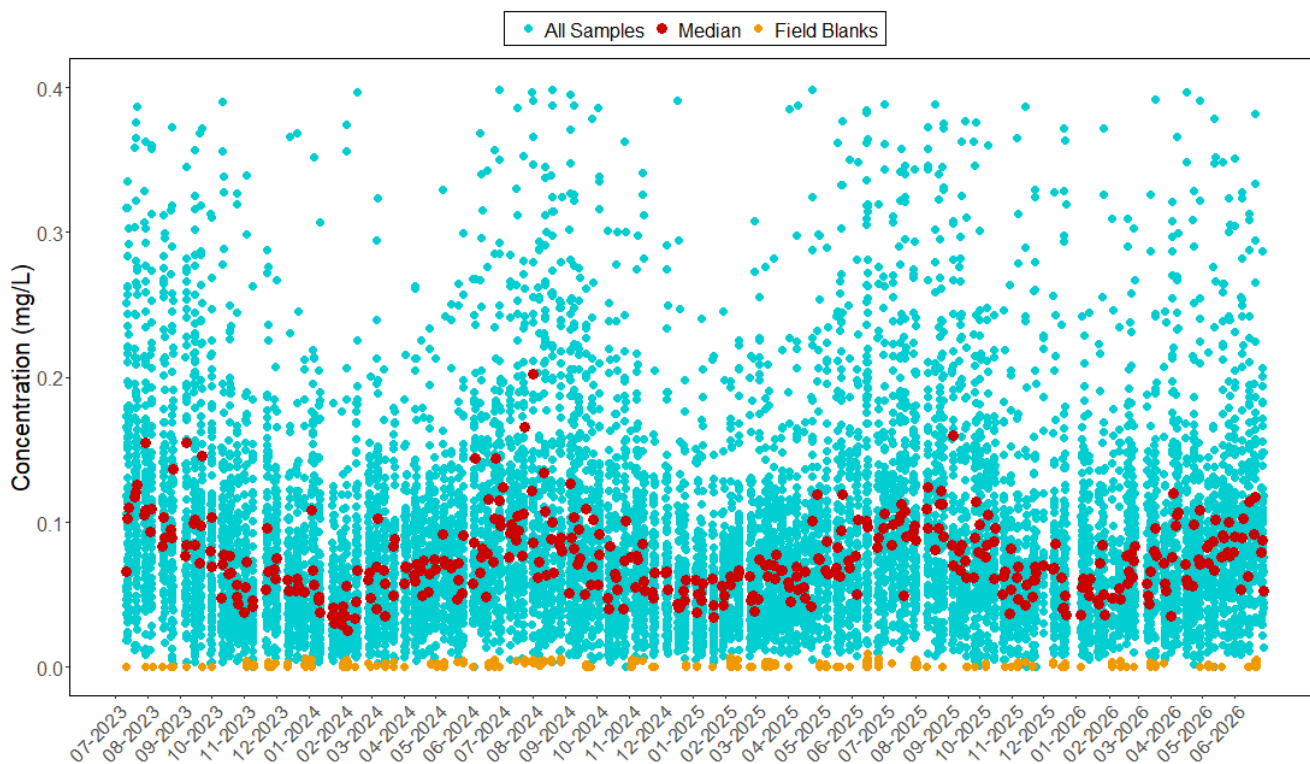
	O ₃ (ppb)	Total NO ₃ ⁻	NH ₄ ⁺	SO ₄ ²⁻	Ca ²⁺	K ⁺	Mg ²⁺	Na ⁺	Cl ⁻
1996–1998	49	1.1	0.3	0.9					
2004–2006					0.23	0.05	0.04	0.14	0.06
2024–2026	47	0.7	0.2	0.5	0.26	0.04	0.04	0.15	0.11
Percent Change	-2	-41	-47	-38	10	-9	2	9	65

Note: Ozone concentrations are given as ppb. Concentrations for all other parameters are in µg/m³.

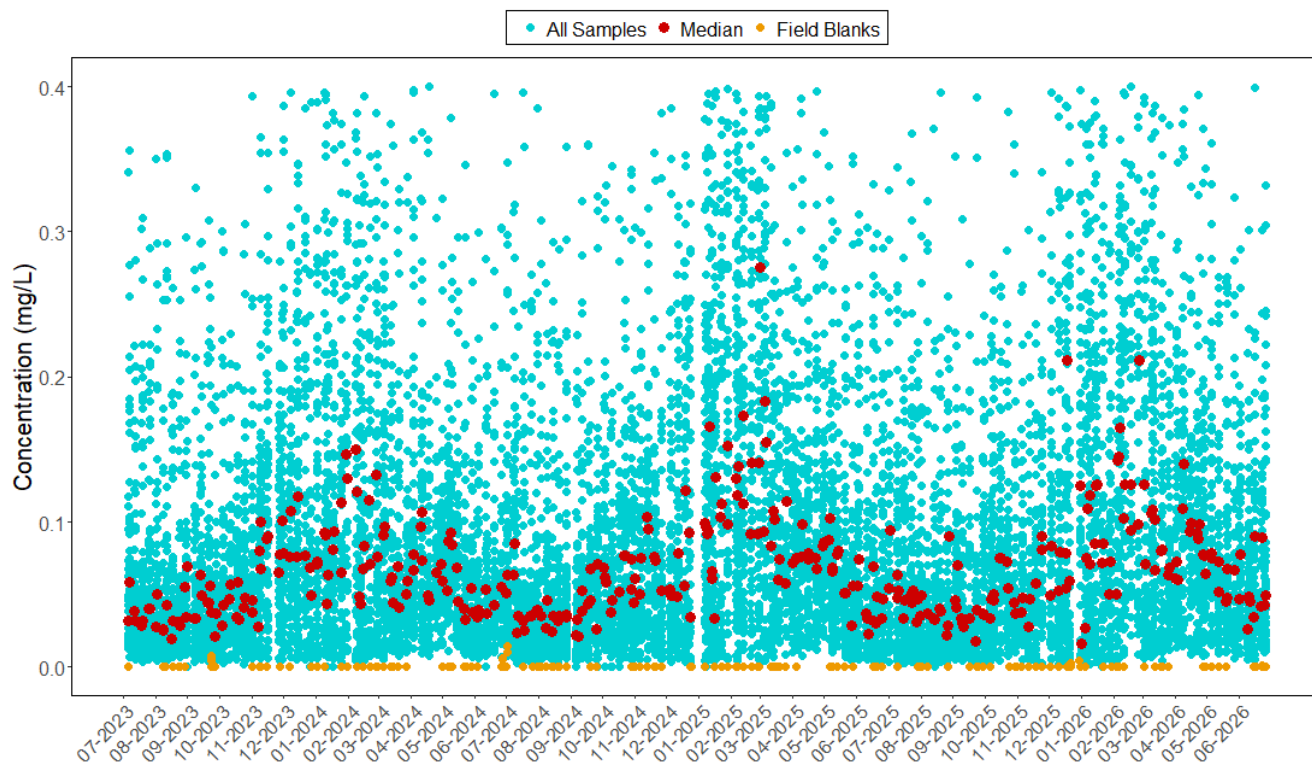
Time Series of Laboratory Analysis Parameters for All Sites

Time series of laboratory-analyzed concentrations of field samples and field blanks of 11 parameters are illustrated in Figures 13 through 23. Data points range from third quarter 2023 through second quarter 2026, and concentrations are measured in milligrams per liter (mg/L) of 11 parameters. These figures provide indications of potential issues with concentration measurements relative to detection and reporting limits.

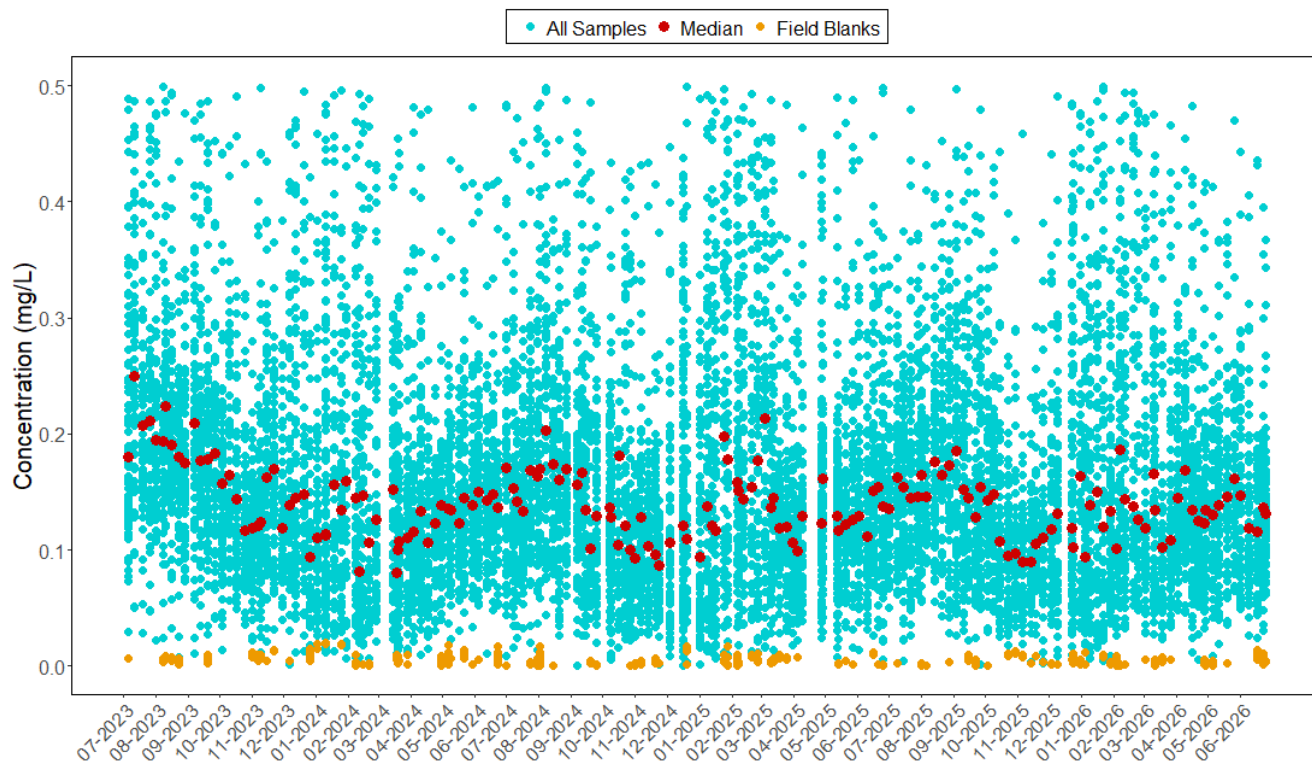
Figure 13. Concentrations of NO_3^- (as N) from Nylon Filters



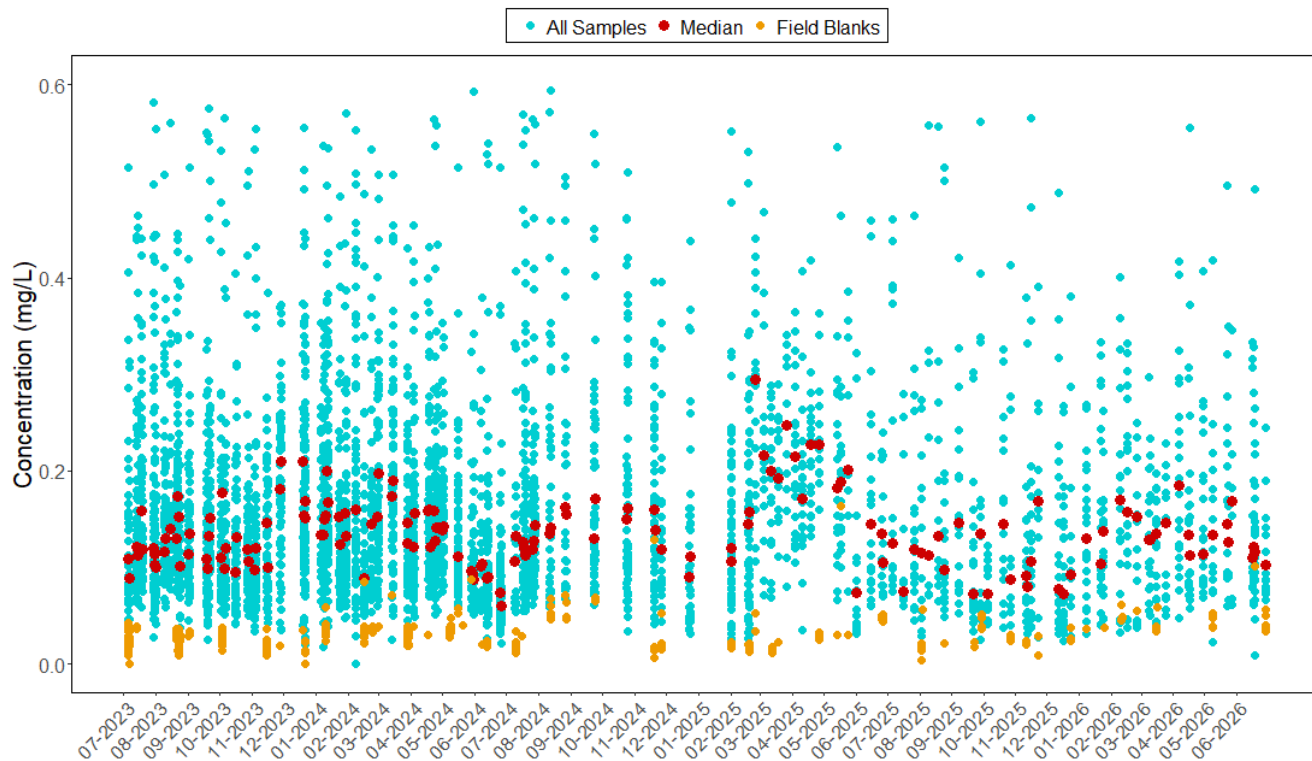
Note: Nominal reporting limit is 0.008 mg/L

Figure 14. Concentrations of NO_3^- (as N) from Teflon Filters

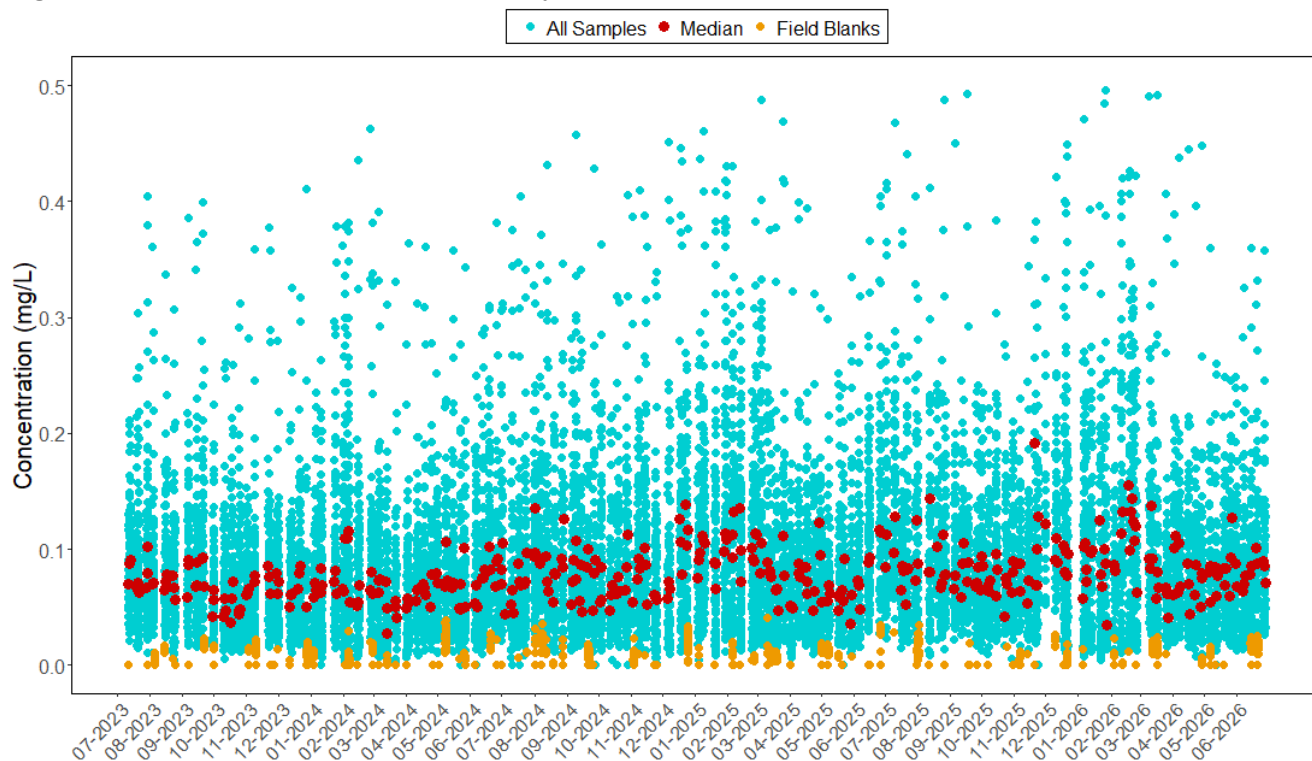
Note: Nominal reporting limit is 0.008 mg/L

Figure 15. Concentrations of NH_4^+ (as N) from Teflon Filters

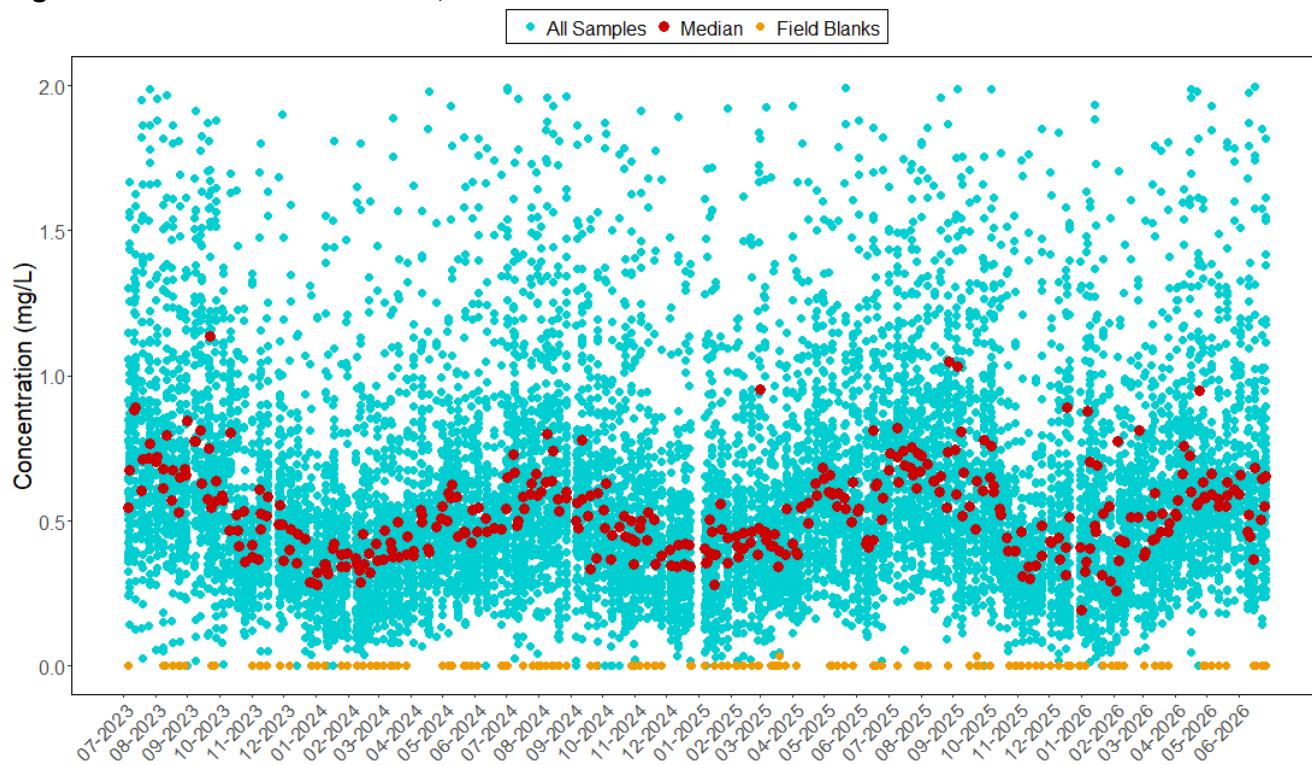
Note: Nominal reporting limit is 0.020 mg/L

Figure 16. Concentrations of SO₂ from Potassium Carbonate-impregnated Cellulose Filters

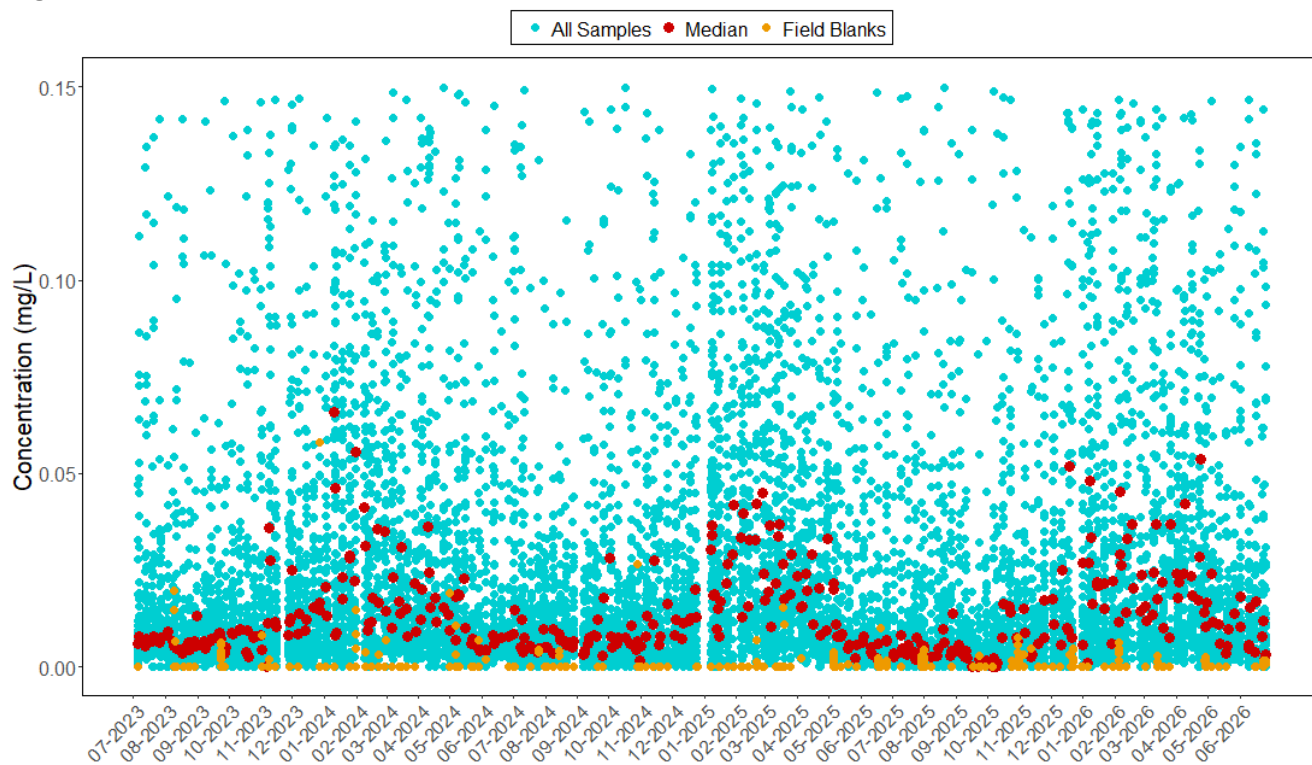
Note: Nominal reporting limit is 0.040 mg/L

Figure 17. Concentrations of SO₄²⁻ from Nylon Filters

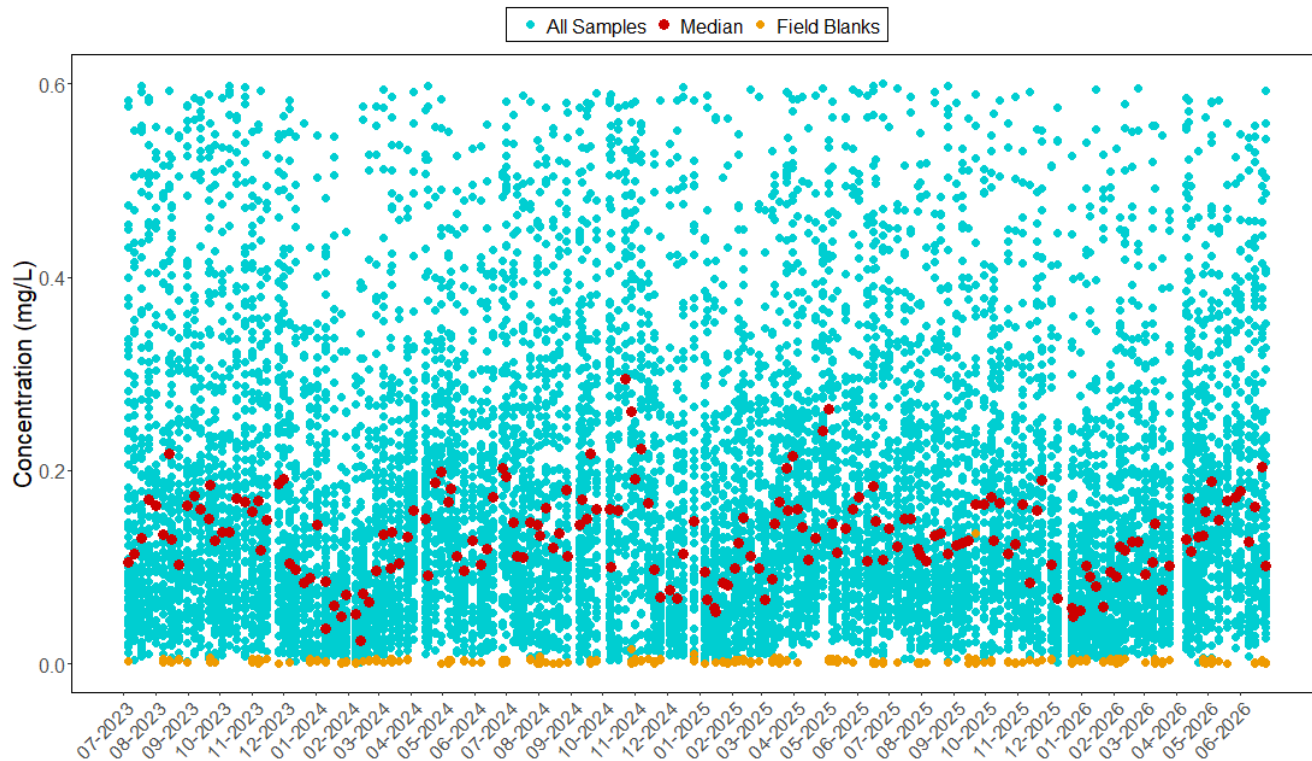
Note: Nominal reporting limit is 0.040 mg/L

Figure 18. Concentrations of SO_4^{2-} from Teflon Filters

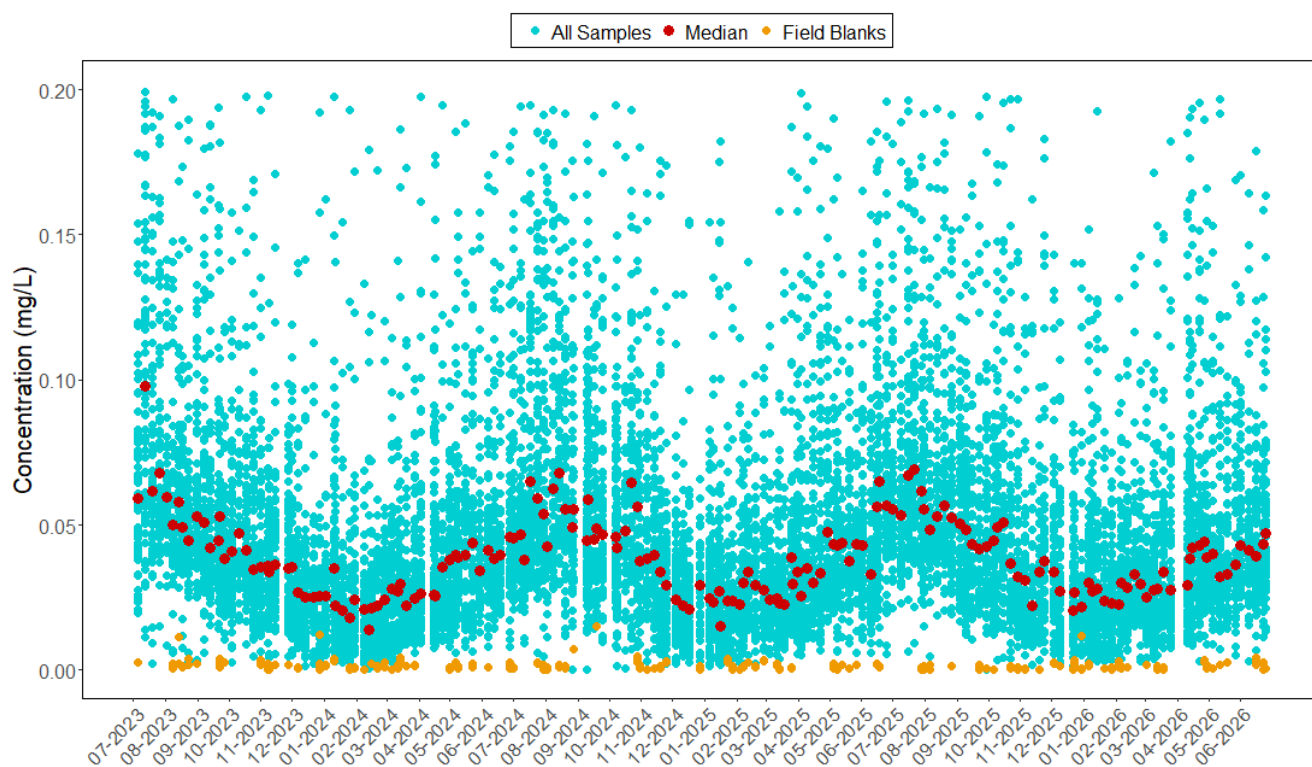
Note: Nominal reporting limit is 0.040 mg/L

Figure 19. Concentrations of Cl^- from Teflon Filters

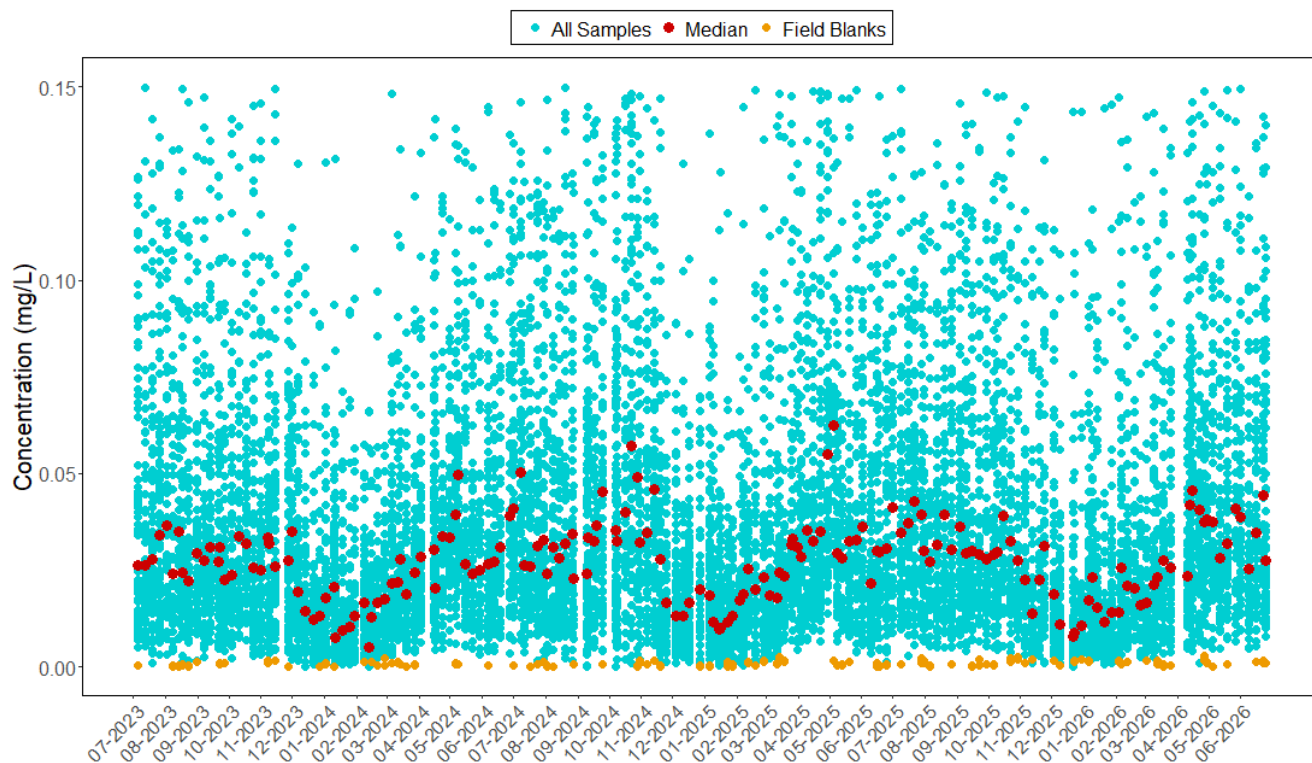
Note: Nominal reporting limit is 0.020 mg/L

Figure 20. Concentrations of Ca^{2+} from Teflon Filters

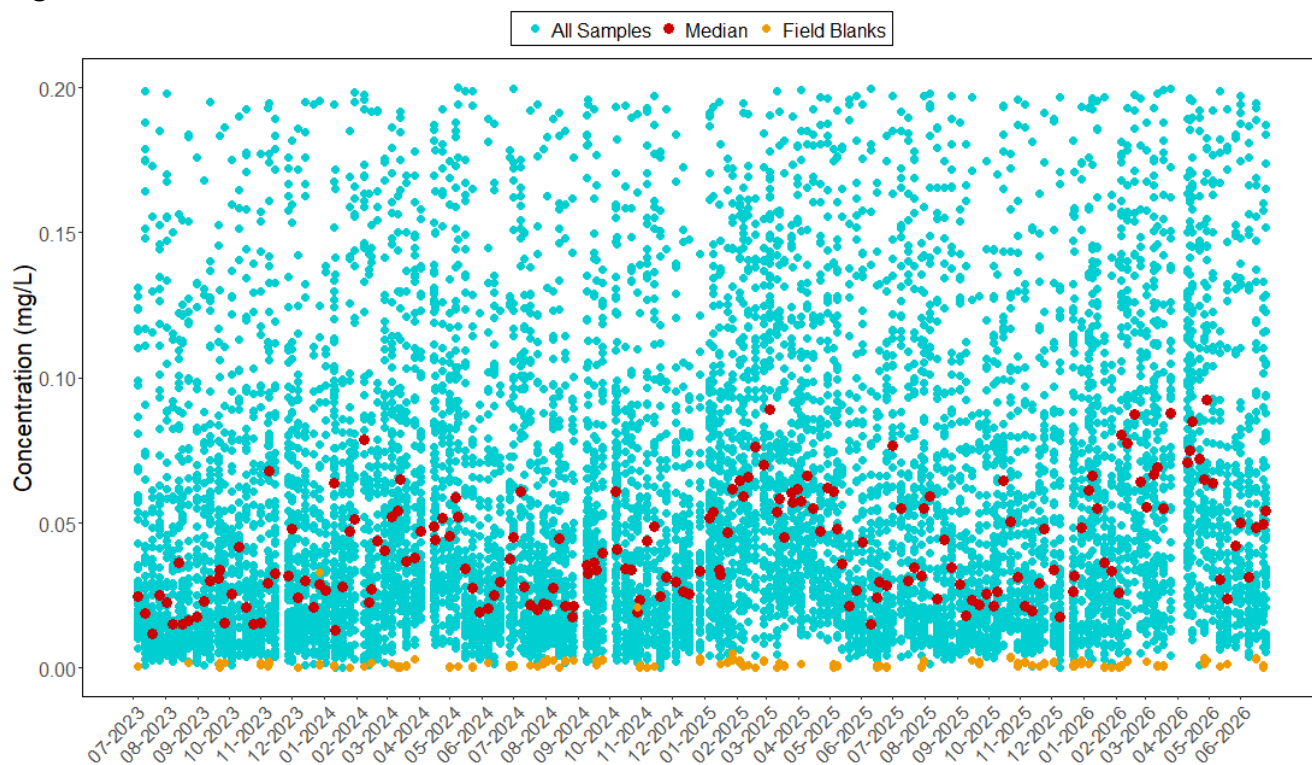
Note: Nominal reporting limit is 0.006 mg/L

Figure 21. Concentrations of K^{+} from Teflon Filters

Note: Nominal reporting limit is 0.006 mg/L

Figure 22. Concentrations of Mg^{2+} from Teflon Filters

Note: Nominal reporting limit is 0.003 mg/L

Figure 23. Concentrations of Na^+ from Teflon Filters

Note: Nominal reporting limit is 0.005 mg/L

Time Series of Concentration Differences from Co-located Sites

Figures 24 and 25 show time series of filter concentration differences between the two sets of co-located sites.

Figure 24. Filter Concentration Differences between MCK131 and MCK231, KY

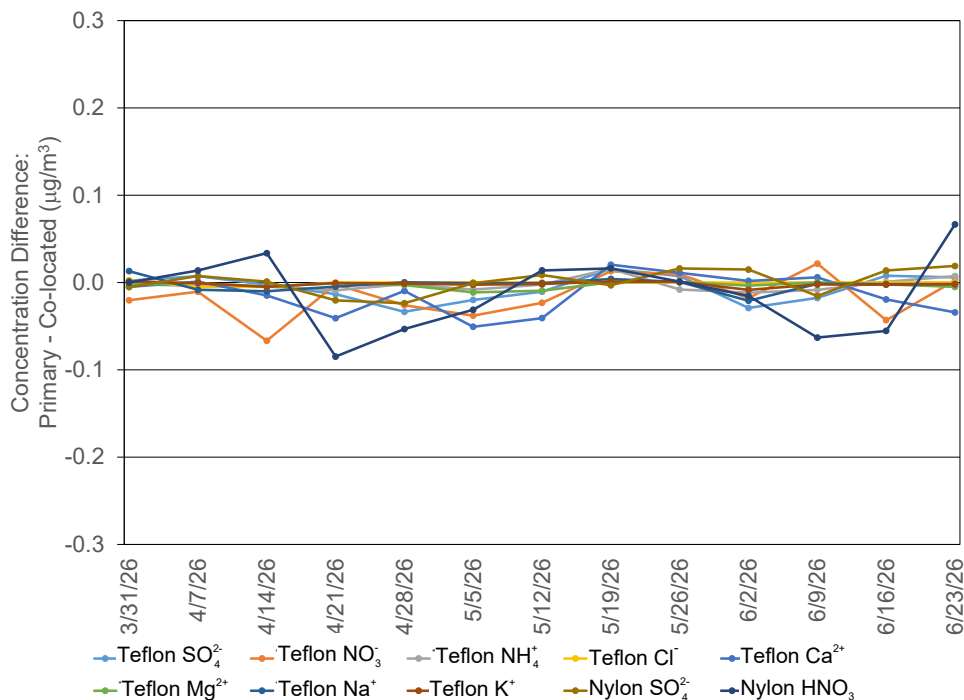
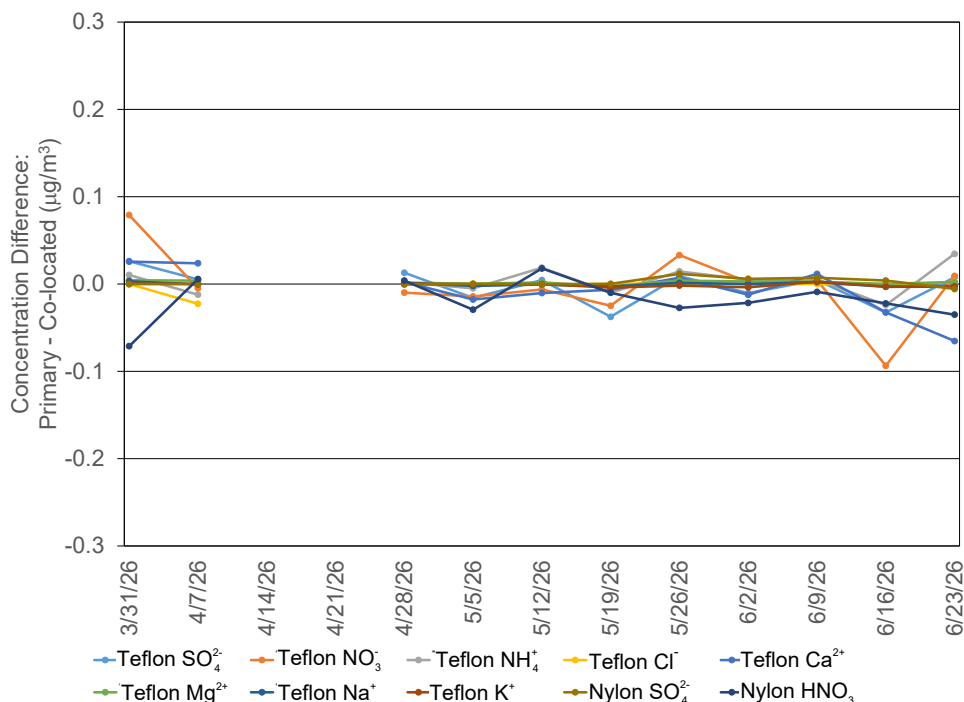


Figure 25. Filter Concentration Differences between ROM406 and ROM206, CO



Precision of Filter Pack Concentrations

Table 4 shows mean absolute relative percent differences (MARPD) for concentrations measured at MCK131/231, KY and ROM406/206, CO during second quarter 2026. The MARPD values met the 20 percent criterion.

Table 4. Precision (MARPD) for Co-located Filter Pack Data during Second Quarter 2026

	Total NO ₃ ⁻	HNO ₃	NO ₃ ⁻	NH ₄ ⁺	SO ₄ ²⁻	Ca ²⁺	Mg ²⁺	Na ⁺	K ⁺	Cl ⁻
MCK131/231, KY										
$\bar{X}$ (μg/m ³)	1.16	0.69	0.48	0.31	0.91	0.27	0.05	0.15	0.06	0.05
$\bar{Y}$ (μg/m ³)	1.18	0.70	0.49	0.32	0.92	0.29	0.05	0.15	0.07	0.05
MAD	0.05	0.04	0.02	0.01	0.01	0.02	0.00	0.01	0.00	0.00
MARPD	4.18	5.15	5.72	3.15	2.13	8.52	6.32	4.79	5.39	1.18
ROM406/206, CO										
$\bar{X}$ (μg/m ³)	0.76	0.47	0.29	0.18	0.51	0.25	0.04	0.05	0.04	0.02
$\bar{Y}$ (μg/m ³)	0.78	0.50	0.29	0.18	0.52	0.25	0.03	0.05	0.05	0.02
MAD	0.03	0.03	0.03	0.02	0.02	0.03	0.00	0.00	0.00	0.00
MARPD	4.24	6.72	12.67	9.56	4.25	10.80	12.24	7.48	6.35	11.85

Completeness for Filter Pack Concentrations

Table 5 shows CASTNET sites with less than 90 percent completeness for weekly filter pack concentrations. Comments are included to provide information on why these sites experienced low data completeness.

Table 5. Sites with Less than 90 Percent Success in Filter Pack Deployment during Second Quarter 2026

Site ID	Teflon SO ₄ ²⁻	Teflon NO ₃ ⁻	Teflon NH ₄ ⁺	Teflon Minor Cations	Teflon Cl ⁻	Nylon HNO ₃	Nylon SO ₄ ²⁻	Cellulose SO ₂	Comments
CKT136, KY	85	85	85	85	85	85	85	N/A	A two-week sample was invalidated due to suspected contamination.
EGB181, ON	62	62	62	62	62	62	62	62	A five-week sample was invalidated.
HAS012, KS	38	38	38	38	38	38	38	38	A seven-week sample was invalidated.
LAV410, CA	85	85	85	85	85	85	85	N/A	There was one two-week sample during the quarter, and one sample was lost in shipping.
LPO010, CA	62	62	62	62	62	62	62	62	There was one three-week sample and one two-week sample during the quarter. Another three samples were invalidated due to mass flow controller malfunction.
SAN192, NE	77	77	77	77	77	77	77	77	There was one three-week sample and one two-week sample during the quarter.
UMA009, WA	85	85	85	85	85	85	85	85	Two samples were invalidated due to power outages.
UVL124, MI	85	85	85	85	85	85	85	N/A	A two-week sample was invalidated due to insufficient flow volume.

Note: N/A = Filter pack SO₂ concentrations were not measured.

Precision of Ozone Concentrations

Time series of hourly O₃ concentration differences for second quarter 2026 are provided in Figures 26 and 27 for co-located sites MCK131/231 and ROM406/206, respectively. Figure 26 indicates a 1 ppb bias with the MCK131 analyzer measuring 1 ppb higher than the MCK231 analyzer. Figure 27 indicates a -2 ppb bias with the ROM206 analyzer measuring 2 ppb higher than the ROM406 analyzer. These biases are less than one percent of full scale for the instruments.

Figure 26. O₃ Concentrations Differences between MCK131 and MCK231, KY

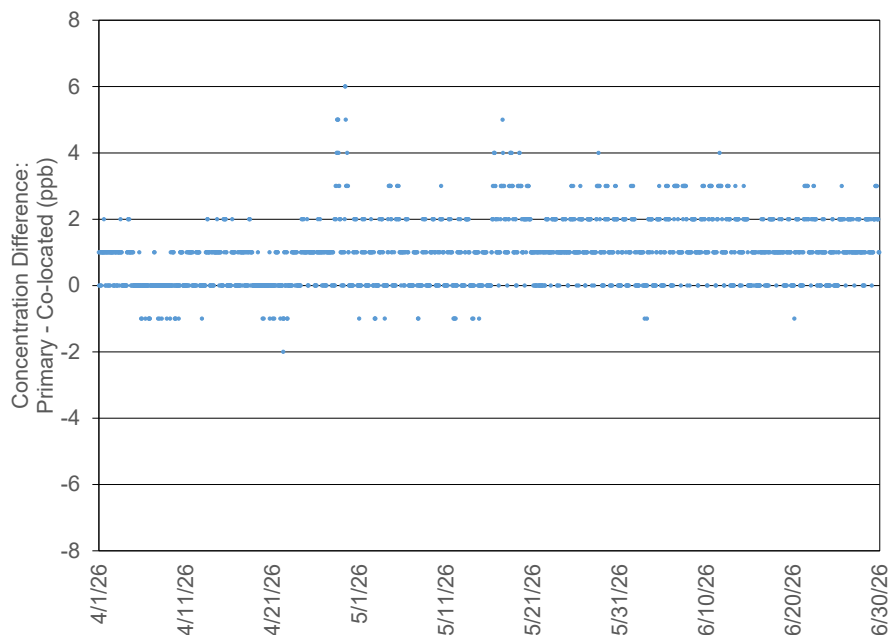


Figure 27. O₃ Concentrations Differences between ROM406 and ROM206, CO

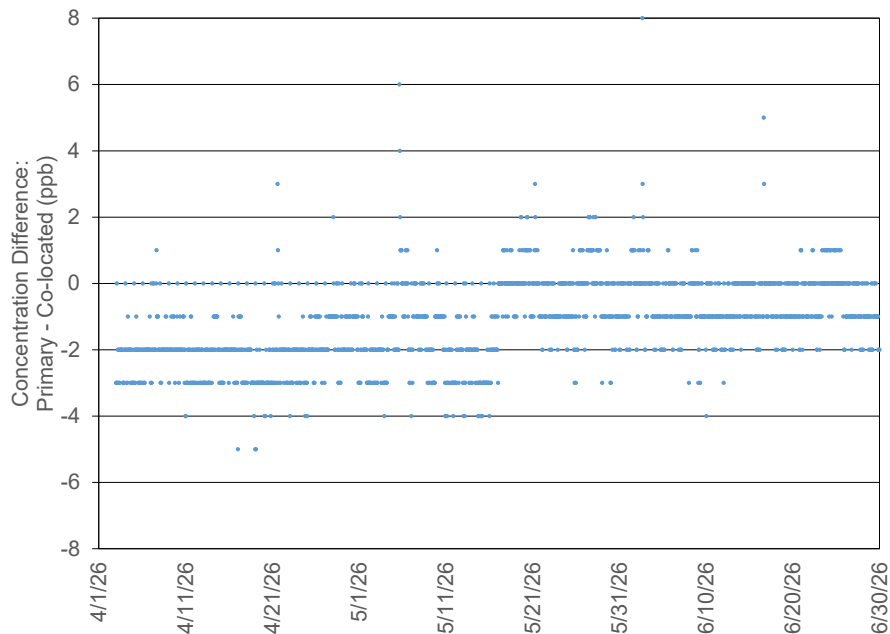


Table 6 gives MARPD data for O₃ data measured at the two co-located sites.

Table 6. Quarterly Precision (MARPD) for Co-located O₃ Concentrations

Site Pair	Quarter	Start Date	MARPD	Records
MCK131/231, KY				
	3	07/01/2025	2.1	2022
	4	10/01/2025	0.9	2065
	1	01/01/2026	0.8	2040
	2	04/01/2026	2.9	2081
ROM406/206, CO				
	3	07/01/2025	4.1	2039
	4	10/01/2025	3.7	1951
	1	01/01/2026	4.4	2051
	2	04/01/2026	2.8	2068

Completeness for Ozone Concentrations

Calculation of an annual O₃ value requires 75 percent completeness. However, calculation of the three-year design value used for regulatory purposes requires 90 percent completeness for MDA8 averaged over the three years. Table 7 shows CASTNET sites with less than 90 percent completeness for MDA8 O₃ concentrations. Comments are provided for these sites.

Table 7. Sites with less than 90 Percent Data Completeness for MDA8 Concentrations during Second Quarter 2026

Site ID	Percent Completeness	Comments
BEL116, MD	81	A power failure in early June necessitated reloading the data logger program. Following this, the analyzer malfunctioned and was replaced affecting data from mid to late June.
CAV436, NM	76	Ozone data were invalid due to poor QC results caused by kinked tubing at the inlet shield from 06/09/2026 - 07/10/2026.
CDR119, WV	87	Ozone data were invalid due to high bench temperatures in April until after the shelter's air conditioner was replaced.
CHA467, AZ	52	Ozone analyzer instrument communications locked up many times throughout the quarter.
CRM435, ID	79	The O ₃ analyzer was down following a planned park power outage from 04/28/2026 - 04/29/2026. Ozone data were invalid until a site operator visited on 05/15/2026 and rebooted the instrument.
DUK008, NC	76	Ozone data were invalid due to high bench temperatures in May and June along with issues regarding analyzer communication with the data logger in June.
LAV410, CA	88	Intermittent power failures occurred during the quarter, and O ₃ analyzer response shifted following the power failures. These caused data to be invalid due to poor QC checks from 04/22/2026 - 04/27/2026, 05/13/2026 - 05/14/2026, and 05/17/2026 - 05/18/2026.
MAC426, KY	77	Ozone were invalid from 05/03/2026 - 05/15/2026 due to a failed motherboard. A replacement analyzer was installed on 05/15/2026 by the operator.
NPT006, ID	73	Data were invalid due to power failures in May, analyzer to data logger communication issues in June, and issues requiring modem resets in June.
SHN418, VA	81	Intermittent power failures occurred during the quarter, and data were invalid due to poor QC checks from 05/23/2026 - 05/28/2026 and 06/08/2026 - 06/10/2026.
UMA009, WA	64	During late May and early June there was an intermittent issue with zero air infiltrating the sample stream. In addition, data were affected from mid to late June by power failures due to a malfunctioning power supply unit.
UVL124, MI	57	Data were invalid due to a leak in the sampling train.

Table 8 shows CASTNET sites with less than 90 percent completeness for hourly O₃ concentrations during second quarter 2026. Comments are provided for these sites. The average-annual percent completeness for each of these sites is included for reference.

Table 8. Sites with less than 90 Percent Data Completeness for O₃ Concentrations

Site ID	Q2 2026	Q3 2025 – Q2 2026	Comments
BEL116, MD	83	89	A power failure in early June necessitated reloading the data logger program. Following this, the analyzer malfunctioned and was replaced, affecting data from mid to late June.
CAV436, NM	76	94	Ozone were invalid due to poor QC results caused by kinked tubing at the inlet shield from 06/09/2026 - 07/10/2026.
CHA467, AZ	60	88	Ozone analyzer instrument communications locked up many times throughout the quarter.
CRM435, ID	80	95	Ozone analyzer was down following a planned park power outage from 04/28/2026 - 04/29/2026. Ozone data were invalid until a site operator visited on 05/15/2026 and rebooted the instrument.
DUK003, NC	87	96	Data were invalid due to high bench temperatures in May and June along with issues regarding analyzer communication with the data logger in June.
MAC426, KY	79	94	Ozone data were invalid from 05/03/2026 - 05/15/2026 due to a failed motherboard. A replacement analyzer was installed on 05/15/2026 by the operator.
NPT006, ID	80	94	Ozone data were invalid due to power failures in May, analyzer to data logger communication issues in June, and issues requiring modem resets in June.
SHN418, VA	87	92	Intermittent power failures occurred during the quarter, and O ₃ data were invalid due to poor QC checks from 05/23/2026 - 05/28/2026 and 06/08/2026 - 06/10/2026.
UMA009, WA	71	86	During late May and early June there was an intermittent issue with zero air infiltrating the sample stream. In addition, data were affected from mid to late June by power failures due to a malfunctioning power supply unit.
UVL124, MI	62	88	Data were invalid due to a leak in the sampling train.

Filter Pack Total Nitrate and Continuous Trace-level NO_y Concentrations at CASTNET Sites

Figures 28 through 32 show a comparison of weekly average continuous NO_y measurements with weekly filter pack total NO₃ concentrations collected at the five sites with NO_y measurements. The NO_y concentrations were consistently higher than the total NO₃ levels at all sites. The average weekly NO_y levels, the weekly total NO₃ concentrations, and their ratios for the five sites with available data are shown in Table 9. Ratios of NO_y to total NO₃ varied from 2.95 at SAN192, NE to 4.28 at STK138, IL.

Table 9. Summary of Total $\text{NO}_3^-/\text{NO}_y$ Measurements for Second Quarter 2026

Site ID	Elevation	Total NO_3^- (ppb)	NO_y (ppb)	Ratio
BVL130, IL	213	0.69	2.58	4.10
DUK008, NC	164*	0.51	1.98	4.04
GRS420, TN	793	0.39	1.32	3.39
SAN192, NE	386	0.58	1.56	2.95
STK138, IL	281	0.65	2.93	4.28

Note: * The inlet of the enhanced NO_y monitor is located at the top of the 30-meter tower.

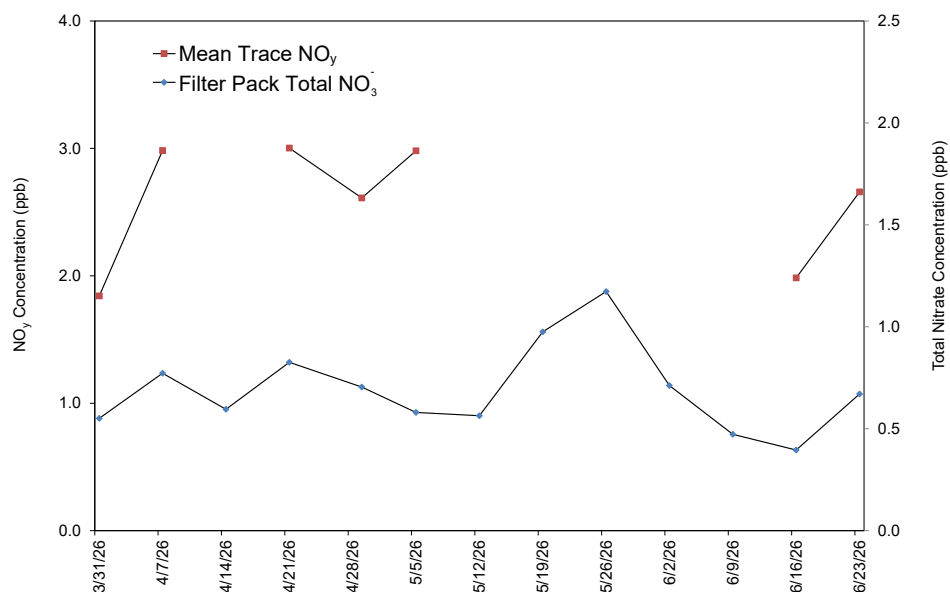
Figure 28. Weekly Mean Continuous NO_y and Total NO_3^- Concentrations BVL130, IL

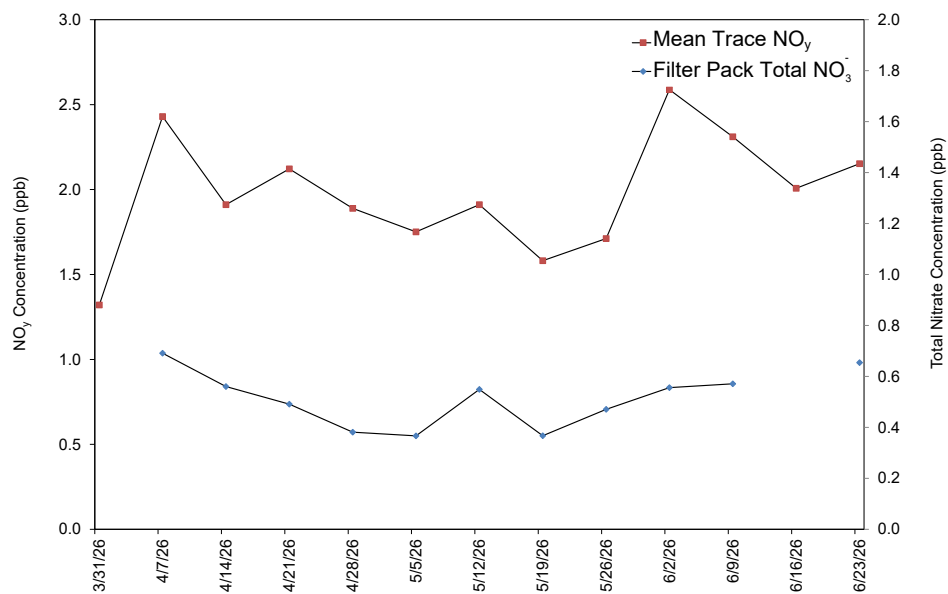
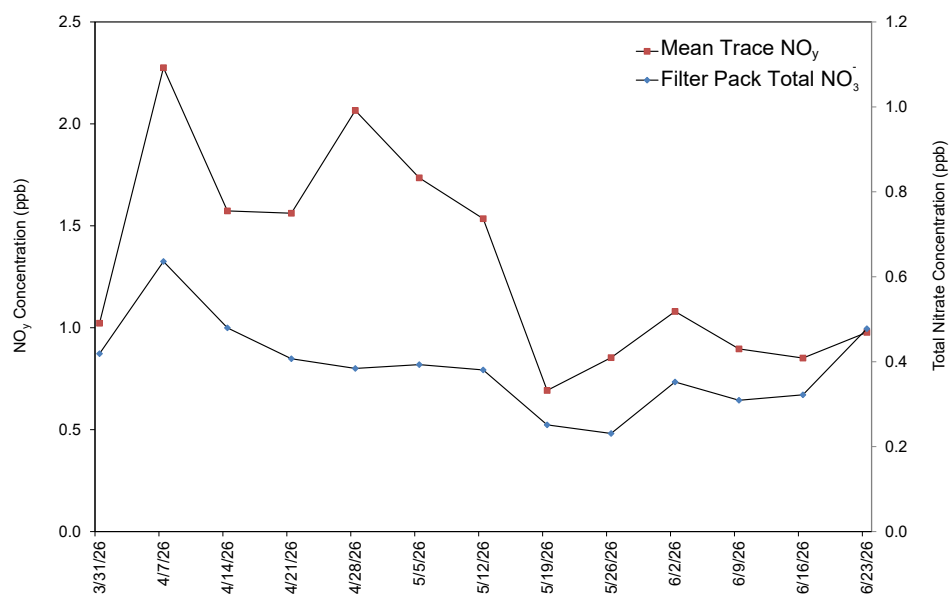
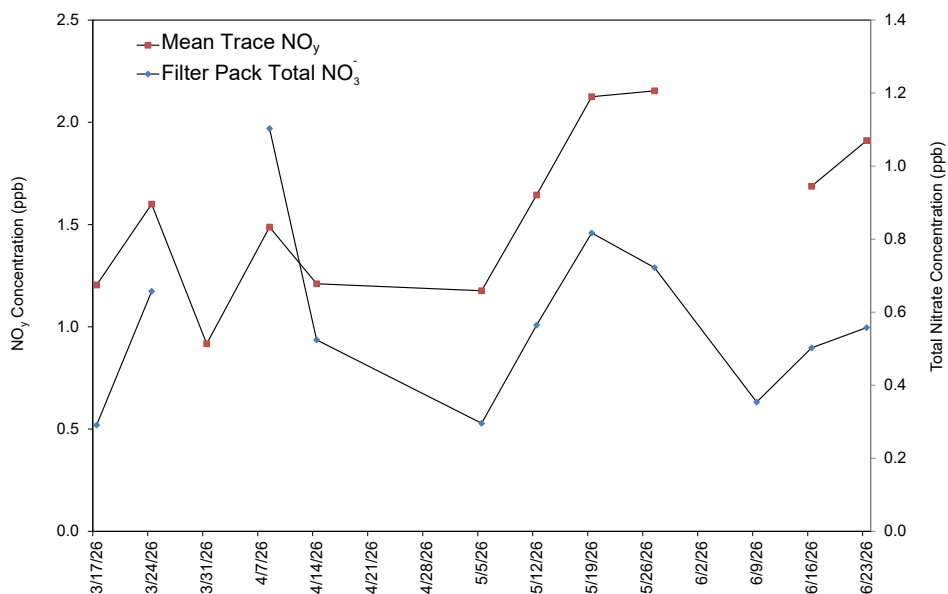
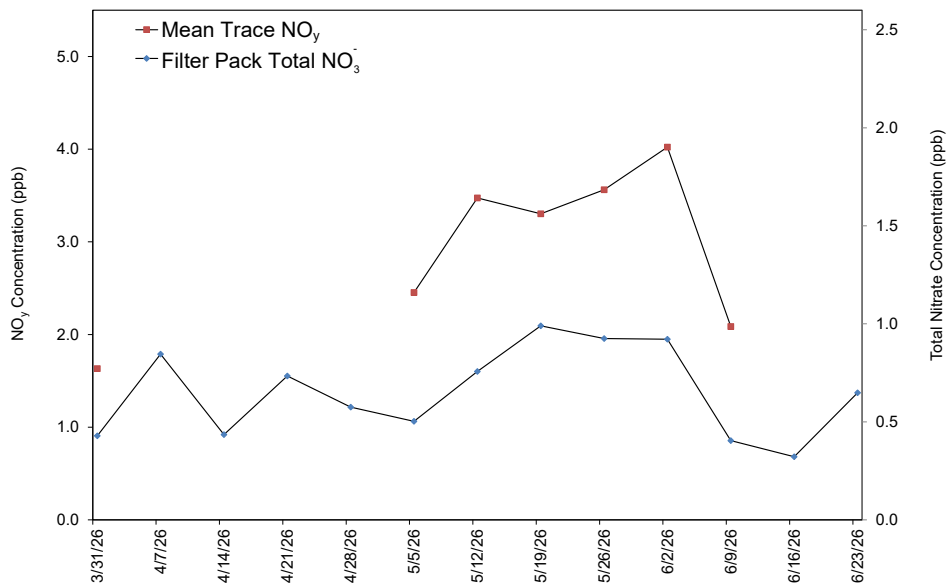
Figure 29. Weekly Mean Continuous NO_y and Total NO_3^- Concentrations at DUK008, NC**Figure 30.** Weekly Mean Continuous NO_y and Total NO_3^- Concentrations GRS420, TN

Figure 31. Weekly Mean Continuous NO_y and Total NO_3^- Concentrations SAN192, NE**Figure 32.** Weekly Mean Continuous NO_y and Total NO_3^- Concentrations STK138, IL

Completeness for Continuous Trace-level Gas measurements

Table 10 shows the percent completeness for CASTNET trace-level gas measurements. Comments are provided for sites with less than 90 percent completeness for hourly trace-level gas concentrations during second quarter 2026. The average completeness for third quarter 2025 through second quarter 2026 for each of the sites is included for reference.

Table 10. Percent Data Completeness for Continuous Trace-level Gas Measurements (1 of 2)

Site ID	Parameter*	Q2 2026	Q3 2025– Q2 2026	Comments
BVL130, IL	CO	72	79	Calibration drift caused data loss in June.
	NO	44	80	PMT cooler malfunction in April and calibration drift in May resulted in data loss.
	NOY	47	77	
	NOYDIF	42	76	
	SO2_GA	88	84	There was a power outage in late April. In addition, the analyzer did not report data for several days in late May.
CHC432, NM	NO	91	96	
	NOX	91	96	
	NOXDIF	91	96	
DUK008, NC	HNO3	89	86	Elevated shelter temperatures caused data loss in May.
	NH3	86	85	
	NO	89	91	
	NO2_TRUE	89	89	
	NOX_TRUE	89	89	
	NOY	89	90	
	NOY_MINUS	89	85	
	NOYDIF	89	90	
	TNX	86	86	
GRS420, TN	CO	68	17	CO analyzer was removed for repair in April 2025 at this site. New CO instrument was installed April 2026.
	NO	93	77	
	NOY	93	77	
	NOYDIF	93	90	
	SO2_GA	93	95	
SAN192, NE	NO	87	78	Data did not update in mid-June. Ethernet cables needed reseating.
	NOY	87	78	
	NOYDIF	87	78	

Table 10. Percent Data Completeness for Continuous trace-level Gas Measurements (2 of 2)

Site ID	Parameter*	Q2 2026	Q3 2025– Q2 2026	Comments
STK138, IL	HNO3	48	47	Solenoid malfunction affected all but one week in April, early May, and mid to late June.
	NH3	48	60	
	NO	71	63	
	NO2_TRUE	71	63	Solenoid malfunctioned from late April into early May. Power failure occurred in mid-April.
	NOX_TRUE	88	67	Power failure occurred in mid-April.
	NOY	48	60	Solenoid malfunction affected all but one week in April, early May, and mid to late June.
	NOY_MINUS	81	69	Solenoid malfunctioned from late April into early May. Power failure in mid-April.
	NOYDIF	45	42	Solenoid malfunction affected all but one week in April, early May, and mid to late June.
	TNX	78	83	Solenoid malfunctioned from late April into early May. Power failure occurred in mid-April and calibration drift in late June.

Note: * See Table 11

The parameters listed in Table 10 are both calculated and measured. Table 11 provides information on how the parameters listed in Table 10 are obtained.

Table 11. CASTNET Trace-level Gas Measurements

Parameter Name	How Obtained	Description of Process
CO	Measured	Gas filter correlation
HNO3	Calculated	NOY minus NOY-MINUS
NH	Calculated	TNX minus NOY
NO	Measured	Chemiluminescence reaction/no converter used
NO2_True	Calculated	NOX_TRUE minus NO
NOX_True	Measured	Photolytic converter
NOY	Measured	Molybdenum converter at 315° Celsius
NOYDIF	Calculated	NOY minus NO
NOY_MINUS	Measured	Sodium carbonate denuder followed by molybdenum converter at 315° Celsius
NOX	Measured	Molybdenum converter at 325° Celsius
NOXDIF	Calculated	NOX minus NO
SO2_GA	Measured	Ultraviolet fluorescence
TNX	Measured	Platinum/stainless steel converter at 825° Celsius followed by molybdenum converter at 315° Celsius

Reference

WSP USA Environment & Infrastructure Inc. (WSP). 2026. Clean Air Status and Trends Network (CASTNET) Second Quarter 2026 Quality Assurance Report.
<https://www.epa.gov/castnet/documents-reports>.