

Petroleum Storage Facility Fenceline Air Monitoring Data Summary (July 2024 – March 2026)

October 2026

Bureau of Air Quality
Maine Department of Environmental Protection



MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION
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1. Executive Summary

In recognition of growing concerns about emissions of volatile organic compounds from petroleum storage facilities, the Maine Legislature enacted Public Law 2021, chapter 294, which established a range of requirements concerning petroleum storage facilities and directed the Maine Department of Environmental Protection (Department) to update applicable regulations. Among other requirements, the law mandates that facilities with certain large aboveground petroleum storage tanks implement fenceline monitoring. In response, the Department adopted Chapter 171, *Control of Petroleum Storage Facilities*, to implement the requirements established by the statute, including the statutory requirement for fenceline monitoring programs, as well as other requirements applicable to petroleum storage facilities statewide. These programs measure concentrations of five volatile organic compounds (VOCs)—benzene, toluene, ethylbenzene, m,p-xylenes, and o-xylene—at locations around facility fencelines. Monitoring is conducted using U.S. Environmental Protection Agency Methods 325A and 325B, which use passive sampling tubes to collect ambient air samples over 14-day periods. Facilities submit the monitoring data to the Department, and the Department makes these reports available to the public through its website.

There are currently 11 Maine petroleum storage facilities with active fenceline monitoring programs. These facilities are located in South Portland (6), Searsport (2), Bucksport (1), Hampden (1), and Bangor (1). This report summarizes fenceline monitoring data collected from the start of monitoring at each facility through the first quarter of 2026, representing approximately 1.5 years of monitoring.

The Department compared the monitoring results to two sets of guidelines. Maine Ambient Air Guidelines (AAGs), which are intended to be protective of lifetime (70-year) exposures, were used to evaluate average concentrations over the 1.5-year monitoring period. Due to concerns in the South Portland area regarding higher levels of VOCs near the fencelines of petroleum storage facilities and shorter-term exposures where

there are homes nearby, the Department also compared the individual 14-day sample concentrations to minimal risk levels developed by the U.S. Agency for Toxic Substances and Disease Registry for acute, short-term exposures (i.e., 1 to 14 days). This report provides a summary of the fenceline monitoring data with result comparisons to AAGs and short-term exposure levels but is not intended as formal health risk assessment. Concentrations measured at a facility fenceline do not necessarily represent the concentrations experienced by people living or working near a facility.

The long-term results for each individual monitor at each facility varied by compound. Long-term average concentrations of toluene and xylenes were below the AAGs at all facilities. Ethylbenzene concentrations were below the AAG at most facilities. At CITGO, South Portland Terminal, and Buckeye (Bangor), however, one monitoring location at each facility had a long-term average ethylbenzene concentration that was slightly above or near the corresponding AAG.

Benzene had the most monitoring locations with long-term average concentrations above the AAG. Portland Pipe Line was the only facility where average concentrations for benzene were below the AAG at every monitoring location. At each of the other 10 facilities, at least one monitoring location had a long-term average benzene concentration above the AAG. At most monitoring locations where the AAG was exceeded, the long-term average benzene concentration was no more than 2.5 times the AAG. The exception was South Portland Terminal, where the long-term average benzene concentration was as high as 4.5 times the AAG. The facility-specific figures in this report show where these concentrations were measured and how benzene concentrations varied among monitoring locations around each facility.

At all 11 facilities, all individual 14-day sample results for benzene, toluene, ethylbenzene, and xylenes were below the applicable short-term health guideline values.

The analysis identified several monitoring locations where benzene concentrations exceeded the AAG. Although AAGs are not regulatory standards, they provide a useful benchmark for identifying locations that may warrant further evaluation. In South Portland, where these benzene concentrations occurred near residential homes, the Department is evaluating the need for additional monitoring beyond certain facility fencelines and closer to nearby residential homes. Continued fenceline monitoring will expand the available record and allow the Department to assess whether observed concentrations persist over time and whether any patterns emerge.

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2. Introduction

2.1. Background

Due to increased concerns about emissions of volatile organic compounds (VOCs) from petroleum storage facilities, the 130th Maine Legislature enacted Public Law 2021, chapter 294, An Act Concerning the Regulation of Air Emissions at Petroleum Storage Facilities. This law required the Maine Department of Environmental Protection (Department) to adopt rules implementing revisions to the Maine Revised Statutes, Title 38, section 590, subsection 1, paragraphs A to E.¹ Among these revisions was a requirement that facilities statewide with certain aboveground petroleum storage tanks implement fenceline monitoring programs. In accordance with this statutory requirement, the Department adopted rule Chapter 171, *Control of Petroleum Storage Facilities*,² which establishes requirements for fenceline monitoring programs and specifies additional control, operating, inspection, testing, recordkeeping, and reporting requirements for licensed petroleum storage facilities. These new regulatory provisions are intended to provide the Department and the public with more frequent, accurate, and detailed information about facility emissions. Chapter 171 became effective August 4, 2023.

As detailed in Chapter 171, licensed facilities with aboveground petroleum storage tanks having storage capacities greater than 39,000 gallons and equipped with external or internal floating roofs are required to implement a fenceline monitoring program designed and operated by a qualified, independent third-party entity. The program must provide continuous emissions monitoring consistent with the requirements of the U.S. Environmental Protection Agency's (EPA) Method 325A, Volatile Organic Compounds from Fugitive and Area Sources: Sampler Deployment and VOC Sample Collection, and

¹ Public Law (PL) 2021, c. 294, An Act Concerning the Regulation of Air Emissions at Petroleum Storage Facilities: <https://legislature.maine.gov/backend/App/services/getDocument.aspx?documentId=90366>

² DEP Chapter 171, Control of Petroleum Storage Facilities: <https://www.maine.gov/sos/sites/maine.gov.sos/files/content/assets/096c171.docx>

Method 325B, Volatile Organic Compounds from Fugitive and Area Sources: Sampler Preparation and Analysis.^{3,4} Facilities are required to submit copies of all data collected as part of their fenceline monitoring programs to the Department on a quarterly basis, and the Department makes these records available on its publicly accessible website.⁵ Required submission data include sample identification numbers, locations, sampling start and end dates/times, analyte concentrations, and wind data for the sampling period.

Petroleum storage facilities subject to Chapter 171 were required to submit fenceline monitoring plans for Department approval within three months of the rule's effective date and to begin monitoring within six months of plan approval.

3. Methods

3.1. Facilities

There are currently 11 petroleum storage facilities subject to Chapter 171. All facilities submitted their monitoring plans by the November 3, 2023, deadline and began monitoring by the required start date. Table 1 lists the Maine facilities with fenceline monitoring programs alphabetically by location, along with their monitoring start dates and number of monitoring locations.

³ Method 325A – Volatile Organic Compounds from Fugitive and Area Sources: Sampler Deployment and VOC Sample Collection: <https://www.epa.gov/emc/method-325a-volatile-organic-compounds-fugitive-and-area-sources-sampler-deployment-and-voc>

⁴ Method 325B - Volatile Organic Compounds from Fugitive and Area Sources: Sampler Preparation and Analysis: <https://www.epa.gov/emc/method-325b-volatile-organic-compounds-fugitive-and-area-sources-sampler-preparation-and>

⁵ Chapter 171 Fenceline Monitoring Report List:
<https://www.maine.gov/dep/air/licensing/ch171fenceline.html>

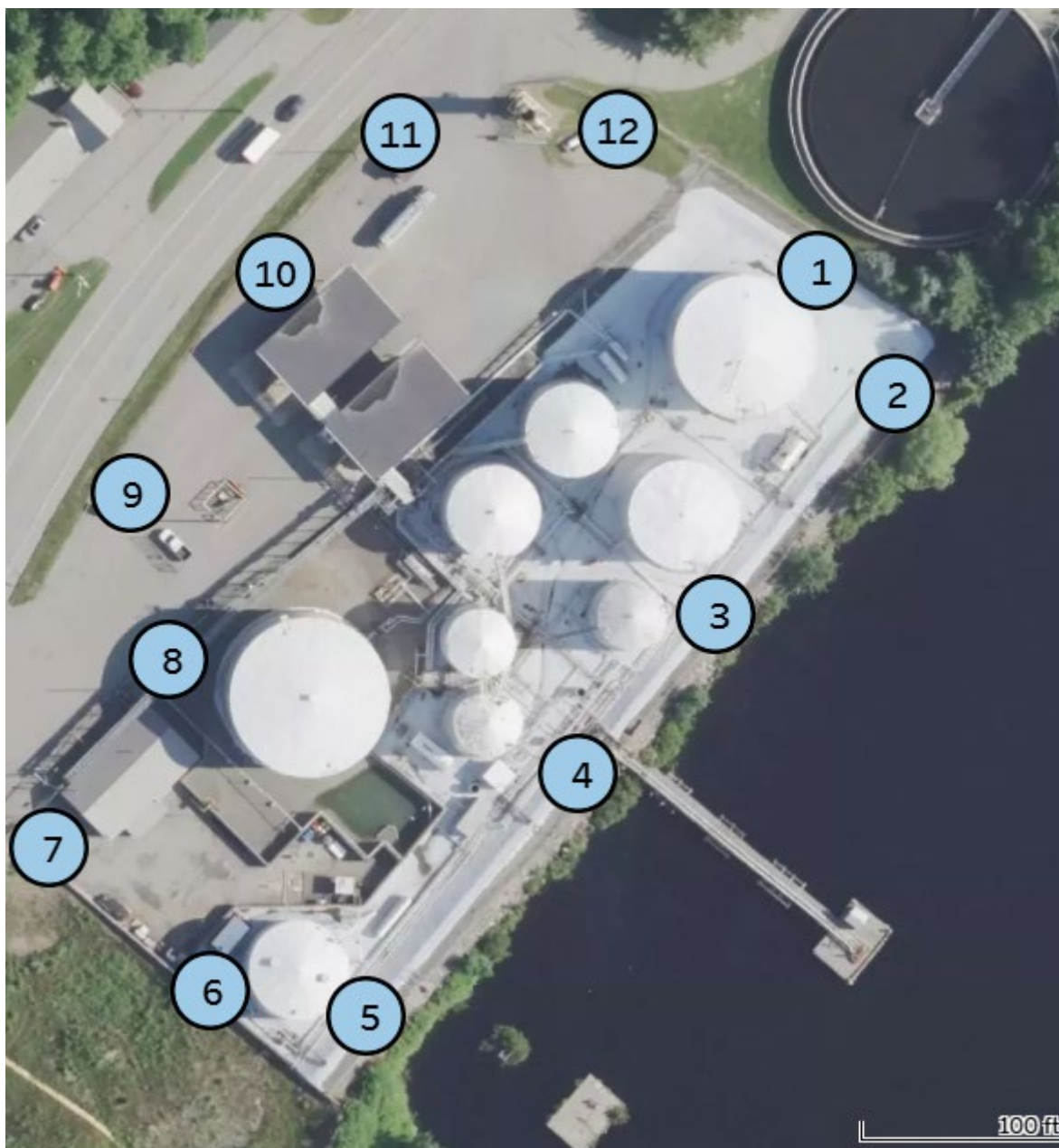
Table 1. Maine facilities with fenceline monitoring programs

Location	Facility name	Monitoring start date	Number of active monitoring locations
South Portland	CITGO Petroleum Corporation	8/27/2024	18
	Global Companies LLC	8/21/2024	17
	Portland Pipe Line Corporation	7/17/2024	13
	South Portland Terminal LLC	8/28/2024	16
	Sprague Operating Resources LLC	9/3/2024	16
	Sunoco Midstream LLC (formerly Portland Terminals LLC and Gulf Oil Limited Partnership)	7/25/2024	12
Searsport	Irving Oil Terminals Inc.	9/19/2024	17
	Sprague Operating Resources LLC (d.b.a. Sprague Searsport Terminal)	9/19/2024	12
Bucksport	Penobscot Bay Terminals, Inc. (d.b.a. Webber Tanks)	9/12/2024	15
Hampden	Cold Brook Energy, Inc.	7/10/2024	12
Bangor	Buckeye Terminals, LLC; Down East Emulsions, Limited Liability Company	8/16/2024	16

3.2. EPA Methods 325A and 325B

Facilities with fenceline monitoring programs are required to follow EPA Methods 325A and 325B protocols for passive monitoring of five VOCs: benzene, toluene, ethylbenzene, m,p-xylenes, and o-xylene. Method 325A addresses sampler deployment and collection. Using this method, independent third-party field staff deploy diffusive tube samplers at pre-approved locations around a facility's fenceline. Sampling locations vary based on the length and shape of a facility's fenceline. Maine facilities have between 12 and 18 fenceline monitoring locations per facility as listed in Table 1. Figure 1 shows an example of fenceline monitoring locations and spacing along a facility fenceline.

Figure 1. Example of monitoring locations and spacing along a facility fenceline.



EPA Method 325A specifies sampler heights based on ground level. The bottom of the diffusive sampling cap must be 4.9 to 9.8 feet above ground level, placing samplers at approximately window height for many one- and two-story homes. Tube samplers are exposed to ambient air for 14 days to collect ambient VOCs, and at the end of the sampling period, field staff retrieve and cap the tubes and send them to a commercial laboratory for analysis.

Method 325B covers sample preparation and laboratory analysis. In the laboratory, thermal desorption releases the collected VOCs from the tubes, and the compounds are identified and quantified using gas chromatography mass spectrometry (GCMS).

To provide additional context, it is helpful to understand the use of EPA Method 325A and 325B elsewhere in the country. EPA Methods 325A and 325B are primarily used as guidance for fenceline monitoring around petroleum refineries subject to the federal fenceline monitoring requirements. In these cases, the methods are used primarily to monitor benzene. Federal regulations establish the average annual benzene concentration action level for these facilities as 9 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) or 2.8 parts per billion by volume (ppb-v).⁶ Federal regulations require subject facilities to calculate the difference between each annual concentration of benzene and their previously established baseline to determine if the difference is above or below the benzene action level.

While used for monitoring at refinery fencelines, EPA Methods 325A and 325B are not limited to this use. These methods have been used at fire stations to assess impacts of traffic and urban emissions on air quality in Texas,⁷ in industrial areas to assess how VOCs vary spatially near chemical facilities in Kentucky,⁸ and in an EPA study to

⁶ Enforcement Alert: Benzene Fenceline Monitoring at Petroleum Refineries | US EPA:

<https://www.epa.gov/enforcement/enforcement-alert-benzene-fenceline-monitoring-petroleum-refineries>

⁷ Spatial analysis and land use regression of VOCs and NO₂ in Dallas, Texas during two seasons:

<https://pubmed.ncbi.nlm.nih.gov/21327247/>

⁸ Spatial analysis of volatile organic compounds using passive samplers in the Rubbertown industrial area of Louisville, Kentucky, USA:

<https://www.sciencedirect.com/science/article/abs/pii/S1309104220300544?via%3Dihub>

describe the relationship between air toxics from specific sources with those detected in residential locations in Michigan.⁹

The use of EPA Methods 325A and 325B in Maine varies slightly from the use along refinery fencelines. For fenceline monitoring conducted around Maine petroleum storage facilities under Chapter 171, facilities are required to report monitoring results for five VOCs, rather than benzene alone. In addition, facilities report the concentration of each VOC over each 14-day sampling period rather than the difference between the average concentration and the established baseline. Facilities also report rolling annual average concentrations for each VOC. Chapter 171 uses this approach to provide the Department and the public with a clearer understanding of VOC concentrations along facility fencelines.

3.3. Quality Control

For quality control purposes, EPA Methods 325A and 325B require the collection and analysis of field blanks and co-located duplicate samples. Method 325A specifies the field collection procedures, including the use of at least one co-located duplicate for every 10 field samples and at least two field blanks during each sampling period. Method 325B specifies the analytical and quality control procedures for these samples. Field blanks are used to identify potential contamination associated with sample shipment, collection, and storage. A field blank must contain no more than one-third of the concentration of a target analyte measured in an associated field sample; if this requirement is not met, the associated result is flagged as an estimate and potentially biased high. Co-located duplicate samples are used to evaluate the precision of the overall sampling and analysis process. Under Method 325B, duplicate results are

⁹ The Design and Field Implementation of the Detroit Exposure and Aerosol Research Study: https://www.researchgate.net/publication/23403291_The_Design_and_Field_Implementation_of_the_Detroit_Exposure_and_Aerosol_Research_Study

compared using relative percent difference (RPD), and data are flagged when the duplicate results do not agree within 30%.

EPA Method 325B specifies that affected data be flagged when the quality control criteria are not met, but it does not establish a separate threshold for determining whether data should be excluded based on field blank contamination or duplicate precision exceedances. A review of the duplicate samples identified multiple exceedances of greater than 100% RPD. Given the magnitude of some of the duplicate RPD exceedances, the Department excluded from this analysis all results flagged for failure to meet the field blank or duplicate precision requirements. For example, 5% of all 14-day benzene samples were excluded. Data flagged for field sampling errors, as well as samples collected outside of the 14 +/- 1 day collection window were also excluded from this analysis. Appendix A provides additional details, including example duplicate RPD values and the percentage of data excluded by facility and analyte.

Based on its quality control review, the Department considers the remaining data to provide the most reliable and representative basis for evaluating the fenceline monitoring results. Accordingly, the analysis presented in this report is based on data that met the applicable quality control requirements of EPA Methods 325A and 325B.

3.4. Comparison to Guidelines

Some petroleum storage facilities in Maine have residential homes located close to their fencelines, so this data report compares measured concentrations with Maine's Ambient Air Guidelines (AAGs).¹⁰ These comparisons to AAGs provide additional context for interpreting the fenceline monitoring results and put measured concentrations into perspective by showing whether they are above or below AAGs. These comparisons

¹⁰ Maine Ambient Air Guidelines (2026):

[https://www.maine.gov/dep/air/monitoring/docs/ME_DEP_AAG_LIST_2026_FINAL_with%20notes%20\(002\).pdf](https://www.maine.gov/dep/air/monitoring/docs/ME_DEP_AAG_LIST_2026_FINAL_with%20notes%20(002).pdf)

are intended to characterize conditions at the facility fenceline and should not be interpreted as a formal health risk assessment for people living or working farther from the fenceline. Actual exposure concentrations at nearby homes may differ from those measured at the monitoring locations due to factors such as distance, wind direction, and other environmental conditions.

AAGs are used as the chronic health-based guidelines for evaluating long-term exposure to pollutants in ambient air (e.g., annual averages). AAGs are calculated using the U.S. EPA Regional Screening Level (RSL) calculator, using conservative exposure assumptions of continuous exposure—24 hours per day, 7 days per week—for a 70-year lifetime. The RSL calculator incorporates available information on cancer and/or noncancer health effects associated with long-term exposure to individual pollutants and generates screening levels for each type of health outcome. For pollutants that have both a cancer and a non-cancer screening level, the AAG is based on the more protective of the two—that is, the lower of the two values. Consistent with Department policy, the AAGs use an incremental lifetime cancer risk of 1 in 100,000 as the basis for the guideline. This means that, under the conservative assumption of continuous exposure to a pollutant at the AAG concentration for 24 hours per day, 7 days per week, for a full 70 years, exposure across a population of 100,000 people would be expected to result in one additional case of cancer.

Given continued concerns about short-term exposures related to more than six years of monitoring conducted as part of the South Portland/Portland VOC Air Quality Monitoring Project,¹¹ part of this analysis includes applicable short-term exposure guidelines for comparison. The U.S. Agency for Toxic Substances and Disease Registry (ATSDR) acute minimal risk levels (MRLs) are used in this report for evaluating short-term exposures to VOCs. These guidelines are intended for exposure periods of

¹¹ South Portland/Portland VOC Air Quality Monitoring Project:
<https://www.maine.gov/dep/air/monitoring/spo-voc-monitor.html>

approximately 1 to 14 days and represent concentrations that ATSDR considers unlikely to result in adverse health effects for individuals exposed during that timeframe.

Although m,p-xylenes and o-xylene are reported separately in the facility-submitted fenceline monitoring data, they are combined as total xylenes for comparisons with AAGs and MRLs, as these guidelines are for total xylenes. Accordingly, m,p-xylenes and o-xylene are combined and reported as xylenes throughout the remainder of this report.

Table 2 presents the AAGs used to evaluate long-term exposure and ATSDR MRLs used to evaluate short-term exposure for each compound monitored under Maine facility fenceline monitoring programs: benzene, toluene, ethylbenzene, and xylenes.

Table 2. Short-term and long-term health-based guidelines by compound

Compound	AAG (ppb-v)	ATSDR MRL (ppb-v)
Benzene	0.4	9
Toluene	1,320	2,000
Ethylbenzene	0.92	5,000
Xylenes	23	2,000

4. Data Summary

Facilities submit quarterly reports of their fenceline monitoring data to the Department. Depending on the facility, monitoring began either in the third quarter of 2024 (Q3 2024) or the fourth quarter of 2024 (Q4 2024). This report summarizes monitoring data collected from the start of monitoring at each facility through Q1 2026. The reporting period encompasses six complete quarters, or approximately 1.5 years, of monitoring. Data from Q3 2024 are included in this analysis; however, that quarter is incomplete because monitoring began during the quarter. While facilities report data in $\mu\text{g}/\text{m}^3$, this

report presents concentrations in ppb-v to maintain consistency with decades of statewide VOC canister sampling data.¹² Appendix B provides duplicate versions of all figures presented in ppb-v, with concentrations reported in $\mu\text{g}/\text{m}^3$.

4.1. Long-term Average Concentration Comparisons to Ambient Air Guidelines

Figures 2 through 5 show the long-term average concentration results for each monitored compound—benzene, toluene, ethylbenzene, and xylenes—at each facility during the first 1.5 years of fenceline monitoring. The figures show the average concentration detected over the full monitoring period at each monitoring location for each facility and provide a visual representation of the range of average concentrations measured around each facility during the reporting period. For context, each figure also includes the applicable AAG as a health-based comparison value for long-term exposure. The AAG is shown as a reference to help readers understand how measured fenceline concentrations compare with the health-based guideline developed for long-term exposure. These comparisons are intended to provide context for the monitoring results and do not, by themselves, constitute a health risk assessment or indicate the level of exposure experienced by individuals living or working near a facility.

¹² See the 2027 Maine Annual Monitoring Plan and Five-Year Assessment of Maine's Ambient Air Monitoring Network on DEP's Air Monitoring and Reporting website (<https://www.maine.gov/dep/air/monitoring/index.html>) for details about the Maine Hazardous Air Pollutants Network.

Figure 2. Long-term average concentrations of benzene by individual monitor at each facility compared to the AAG

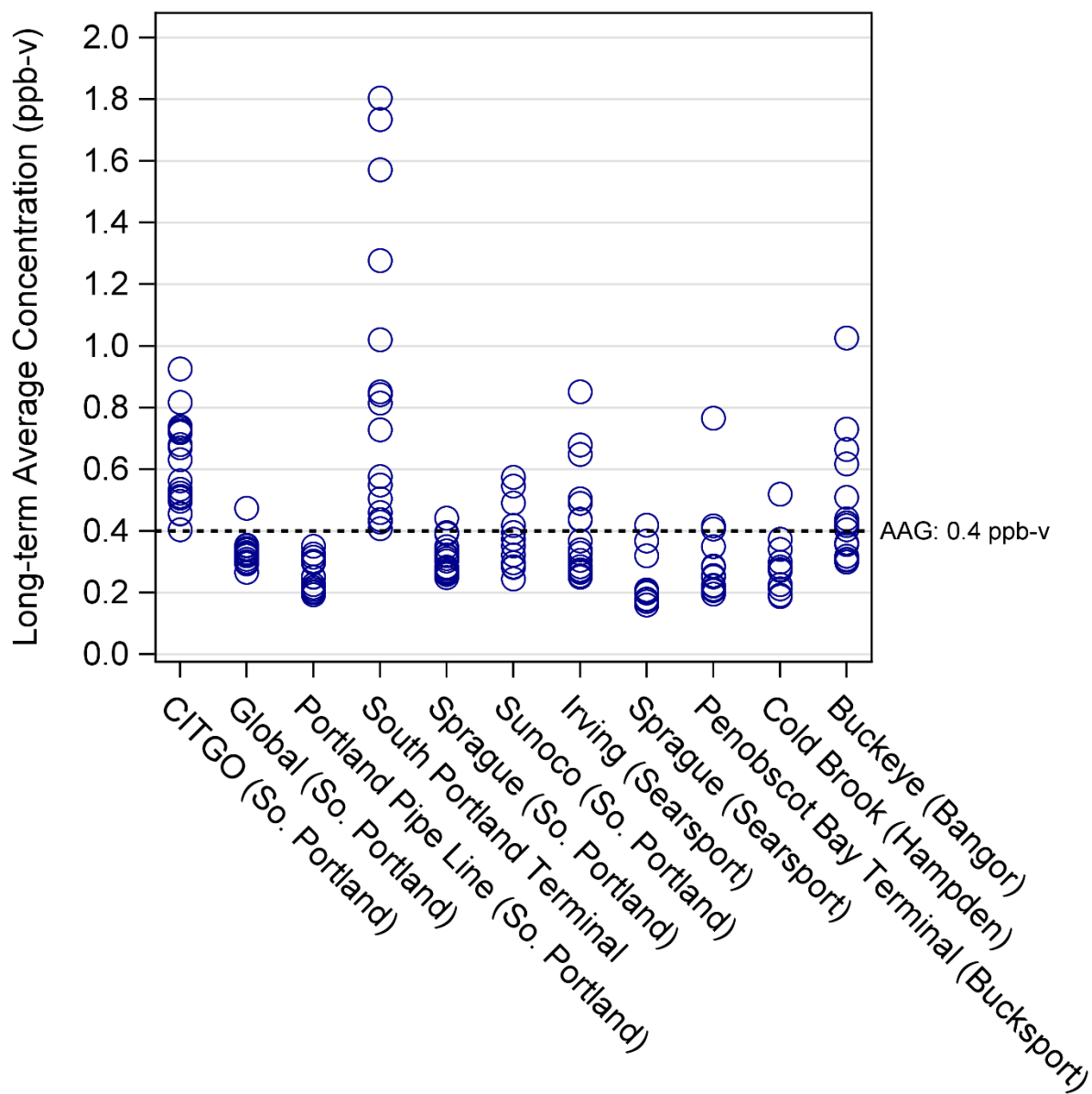


Figure 3. Long-term average concentrations of toluene by individual monitor at each facility compared to the AAG

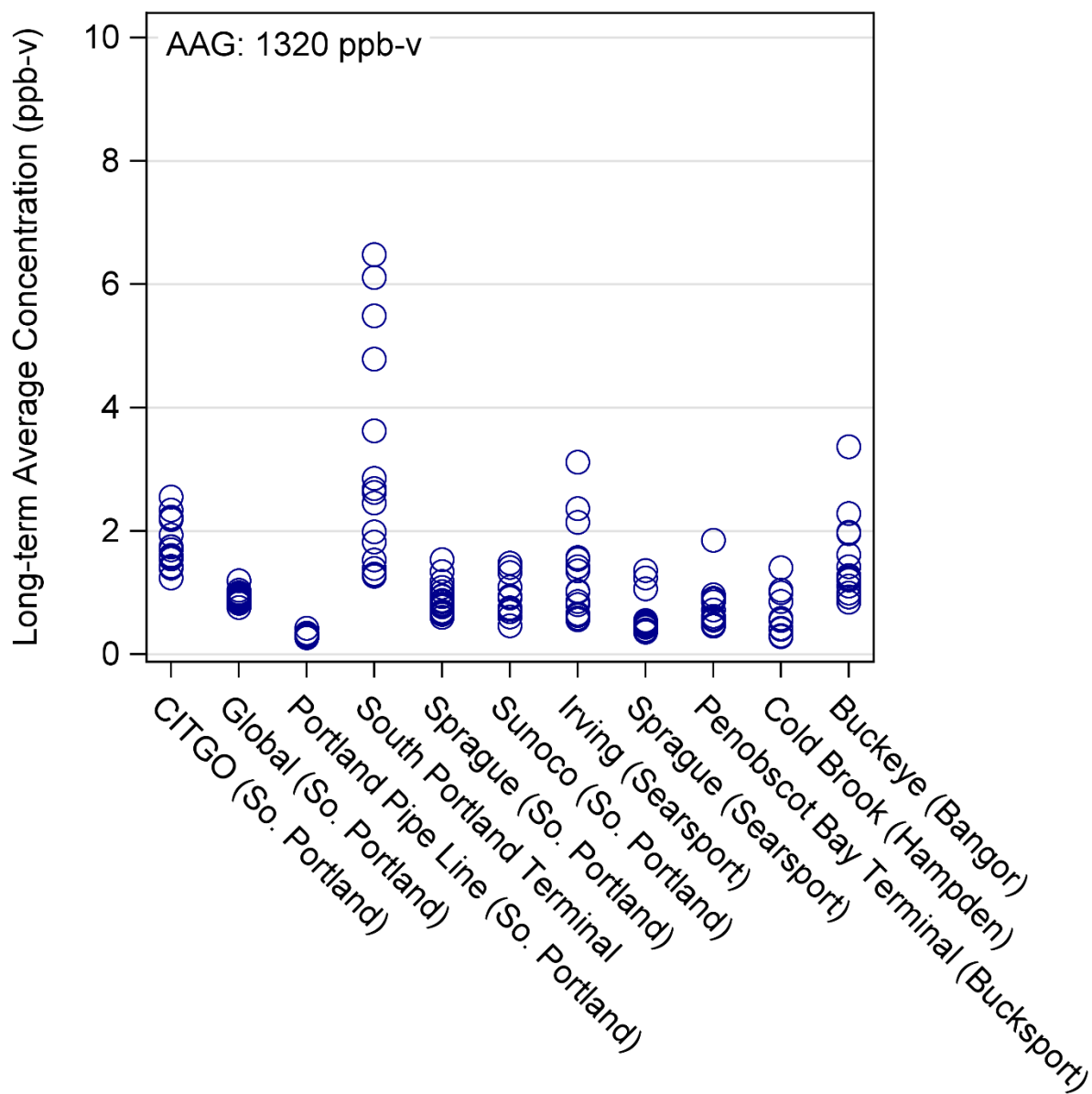


Figure 4. Long-term average concentrations of ethylbenzene by individual monitor at each facility compared to the AAG

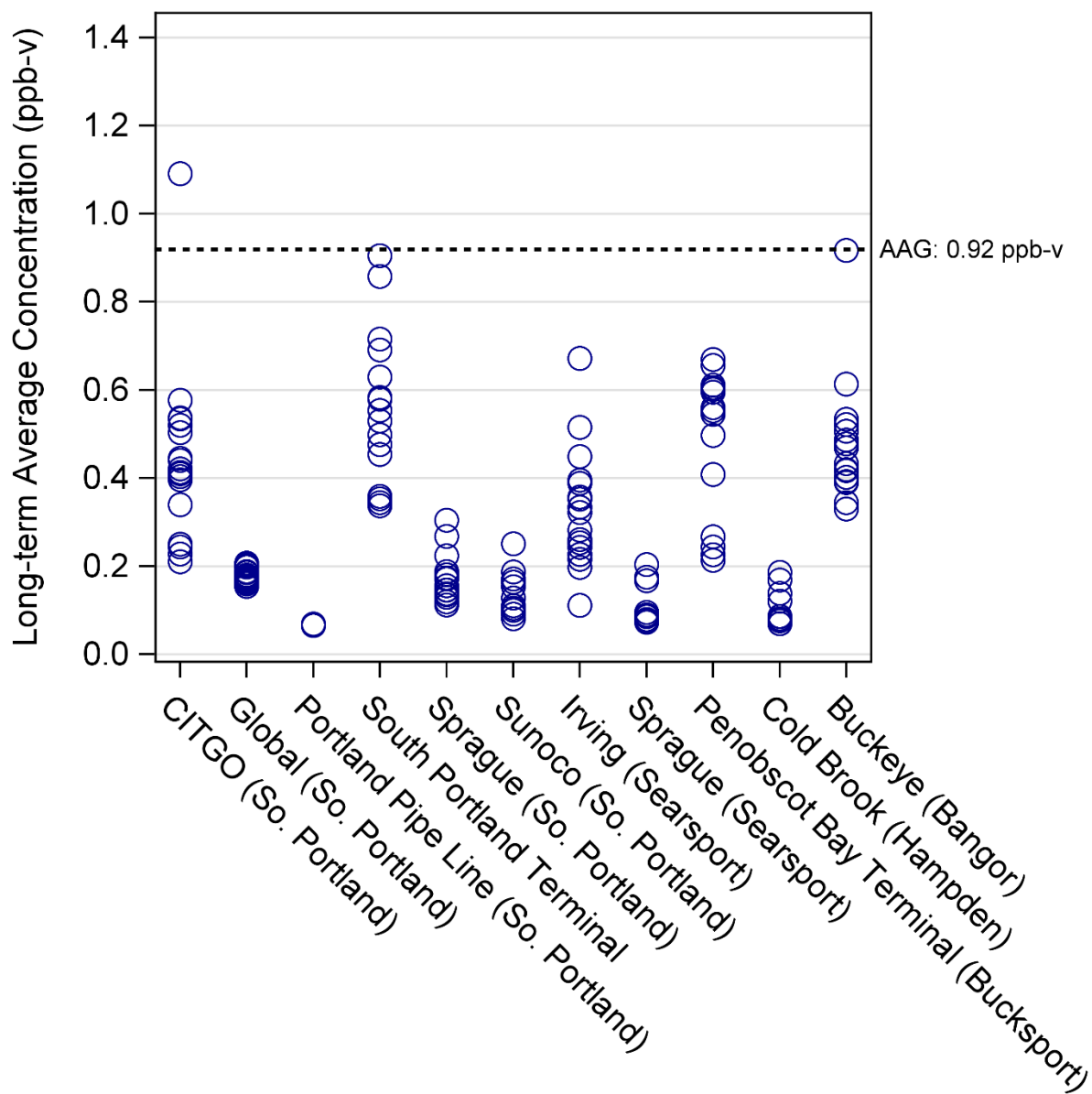
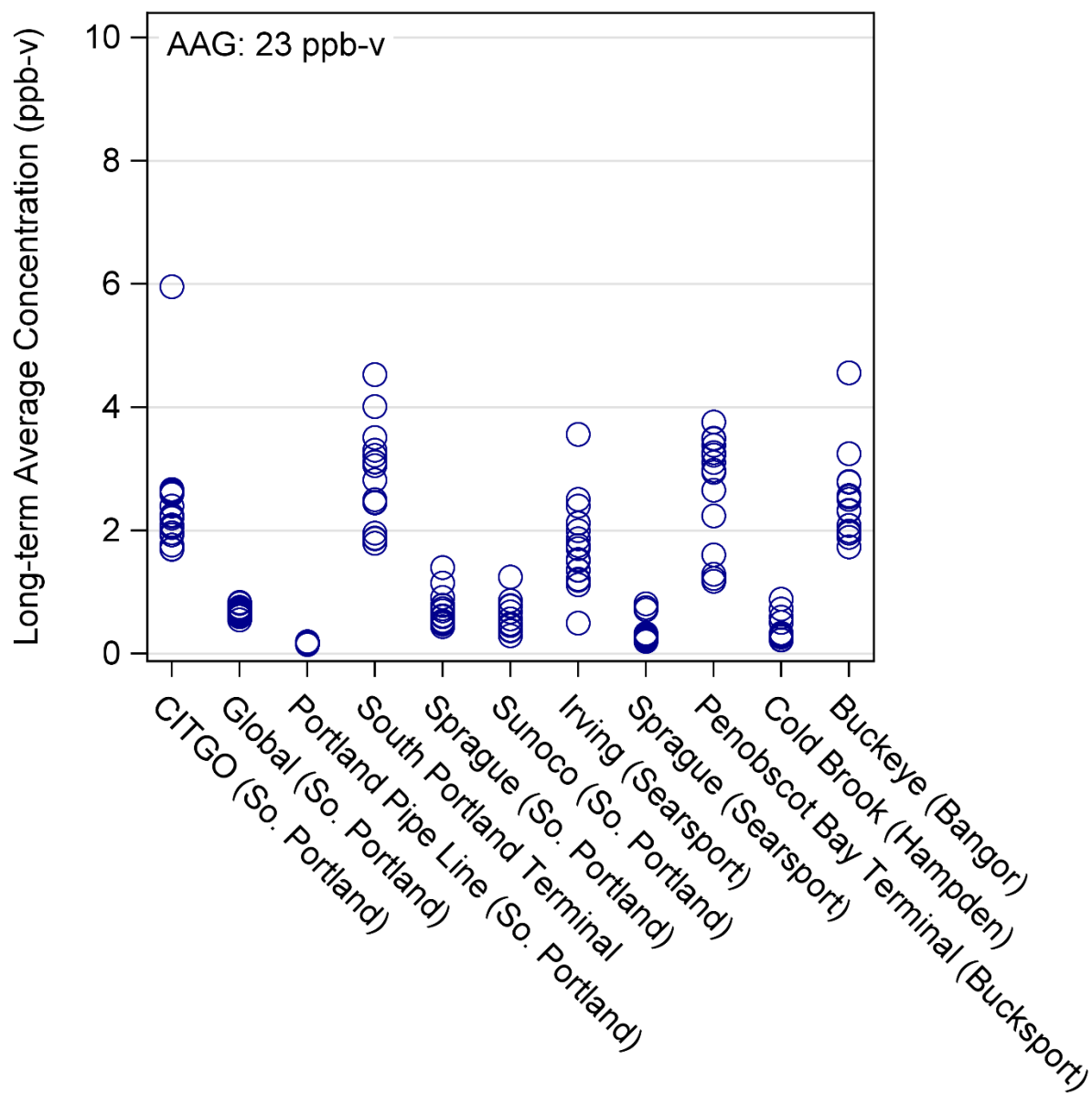


Figure 5. Long-term average concentrations of xylenes by individual monitor at each facility compared to the AAG



All long-term average concentrations of toluene and xylenes were well below the AAG. Long-term average ethylbenzene concentrations were below the AAG at most facilities. The exceptions were CITGO (South Portland), South Portland Terminal, and Buckeye (Bangor), where one monitoring location at each facility had a long-term average concentration that was either slightly above or only slightly below the applicable AAG. Long-term average benzene concentrations at all Portland Pipe Line monitoring locations were below the applicable AAG. In contrast, each of the other facilities had at least one fenceline monitoring location where the long-term average benzene concentration exceeded the AAG.

4.2. Long-term Average Benzene Concentrations by Monitoring Location

Given the results presented in Figure 2, a visual analysis of benzene concentrations at each individual fenceline monitoring location provides additional perspective. Figures 6 through 27 present the long-term average benzene concentrations measured at each monitoring location at each facility during the first 1.5 years of fenceline monitoring. For each facility, two figures are provided. The first figure displays average benzene concentrations as circles at the corresponding monitoring locations on each facility map. The number within each circle identifies the monitoring location, while the relative size of the circle represents the magnitude of the average concentration, with circle sizes determined using 0.5 ppb-v concentration bins. Green circles indicate concentrations below the benzene AAG, while orange circles indicate concentrations above the AAG. This spatial presentation illustrates the distribution of benzene concentrations around each facility and allows concentrations at individual monitoring locations to be compared with the guideline. The second figure for each facility presents the same average benzene concentration for each monitoring location in graphical format. The numbers along the x-axis identify the monitoring locations. Error bars represent 95% confidence intervals, which indicate the range within which the true mean concentration is expected to fall with 95% confidence, based on the variability and number of measurements.

These confidence intervals illustrate the uncertainty around each average concentration. Larger intervals indicate greater uncertainty, while smaller intervals indicate greater confidence in the average.

These figures show the range of concentrations and how these concentrations vary spatially along the fenceline at each facility. For context, each figure also includes the applicable AAG as a comparison value for long-term exposure. These figures show that benzene concentrations at most fenceline monitoring locations near residential homes are below the AAG. The exceptions are shown in Figures 6 (CITGO) and 12 (South Portland Terminal), where monitoring locations with long-term average concentrations above the AAG are located near residential homes.

Figure 6: Long-term average benzene concentrations at CITGO

Figure 7. Long-term average benzene concentrations by monitoring location at CITGO (mean & 95% confidence intervals)

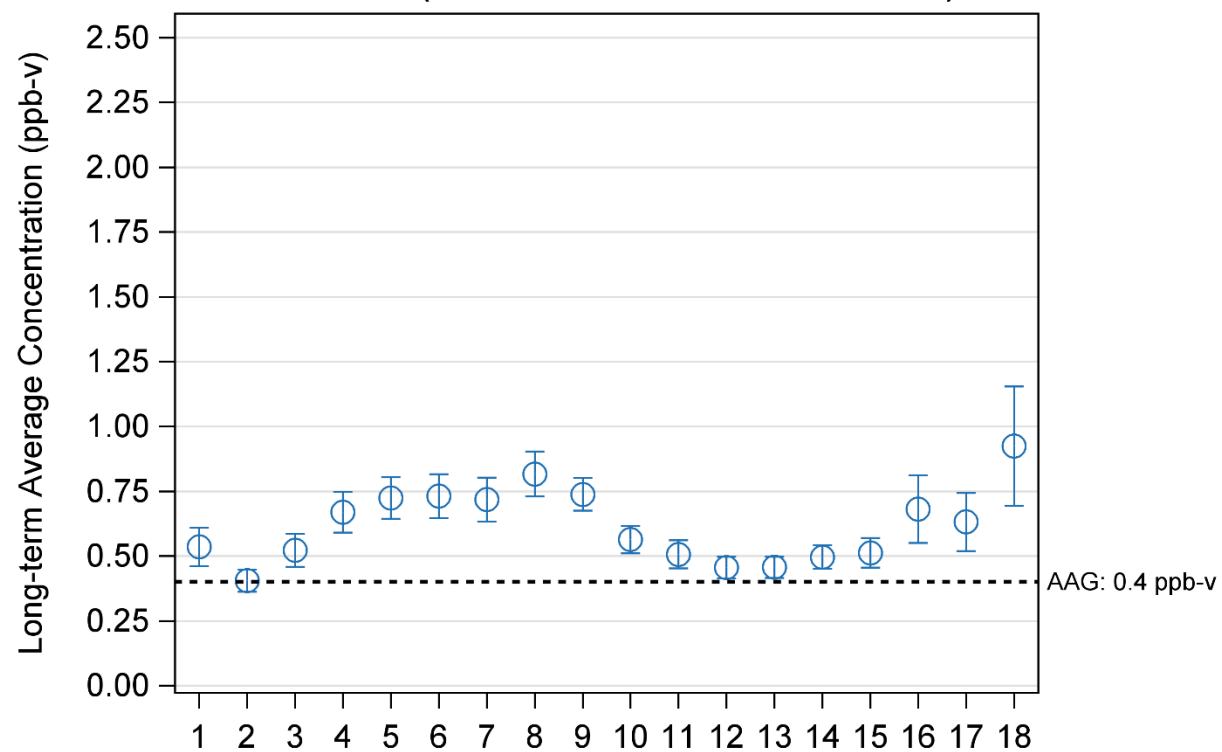


Figure 8: Long-term average benzene concentrations at Global

Figure 9. Long-term average benzene concentrations by monitoring location at Global (mean & 95% confidence intervals)

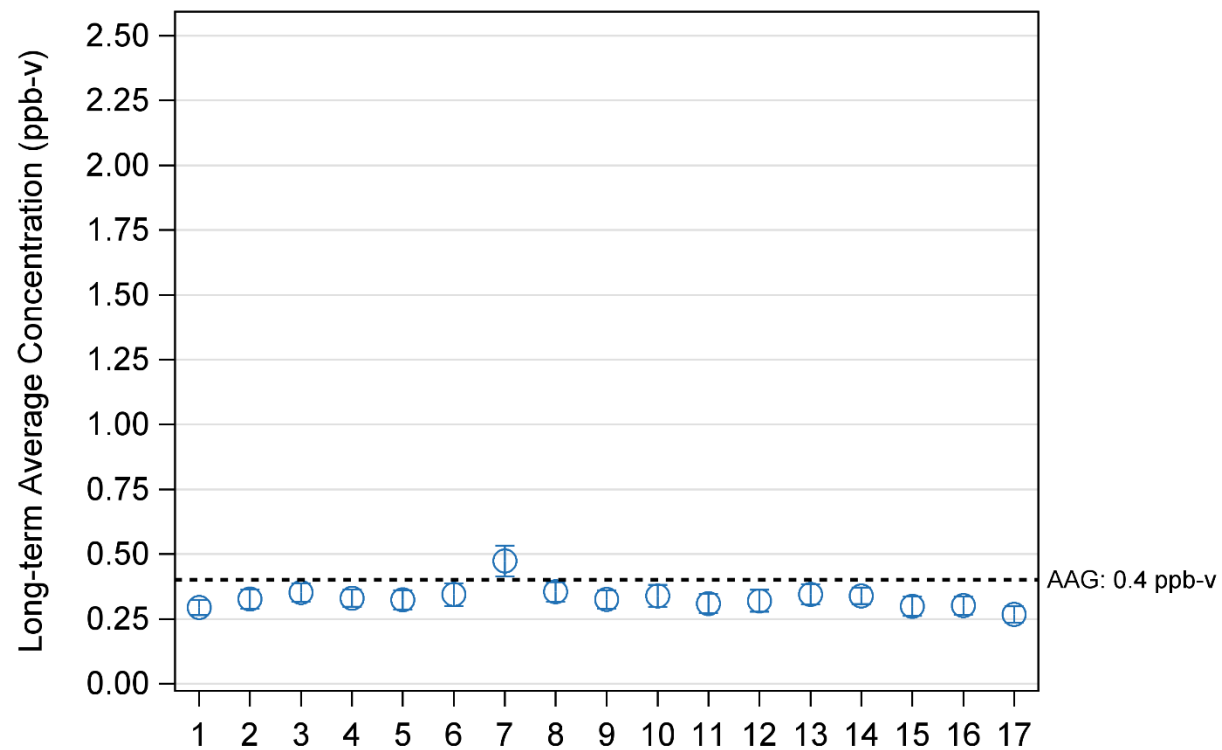


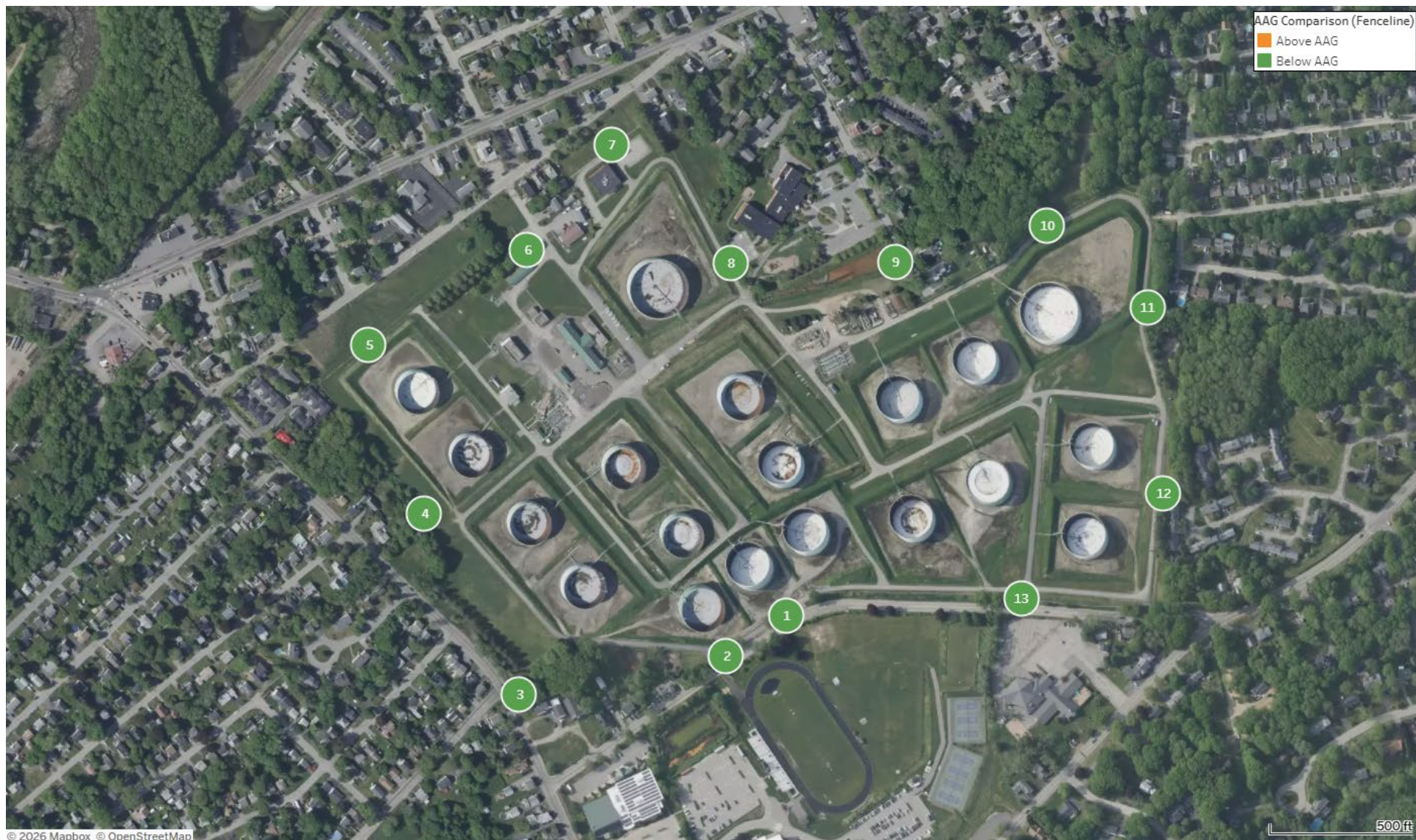
Figure 10: Long-term average benzene concentrations at Portland Pipe Line

Figure 11. Long-term average benzene concentrations by monitoring location at Portland Pipe Line (mean & 95% confidence intervals)

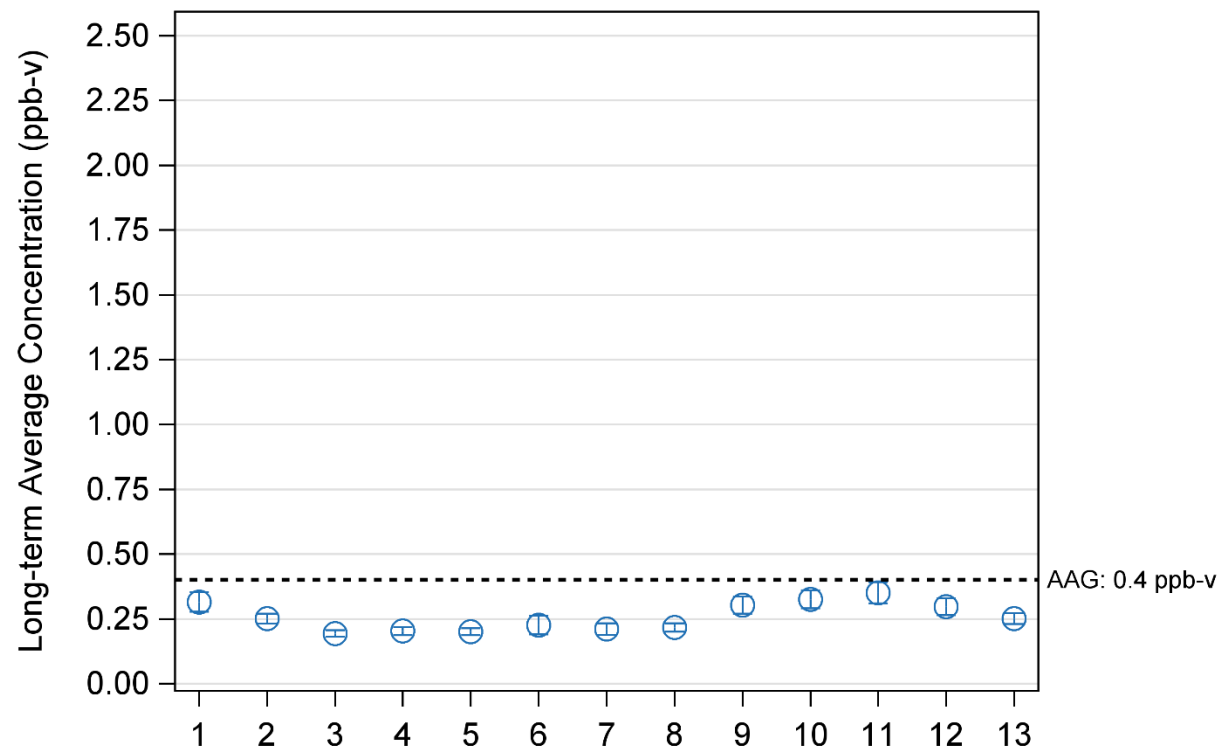


Figure 12: Long-term average benzene concentrations at South Portland Terminal

Figure 13. Long-term average benzene concentrations by monitoring location at South Portland Terminal (mean & 95% confidence intervals)

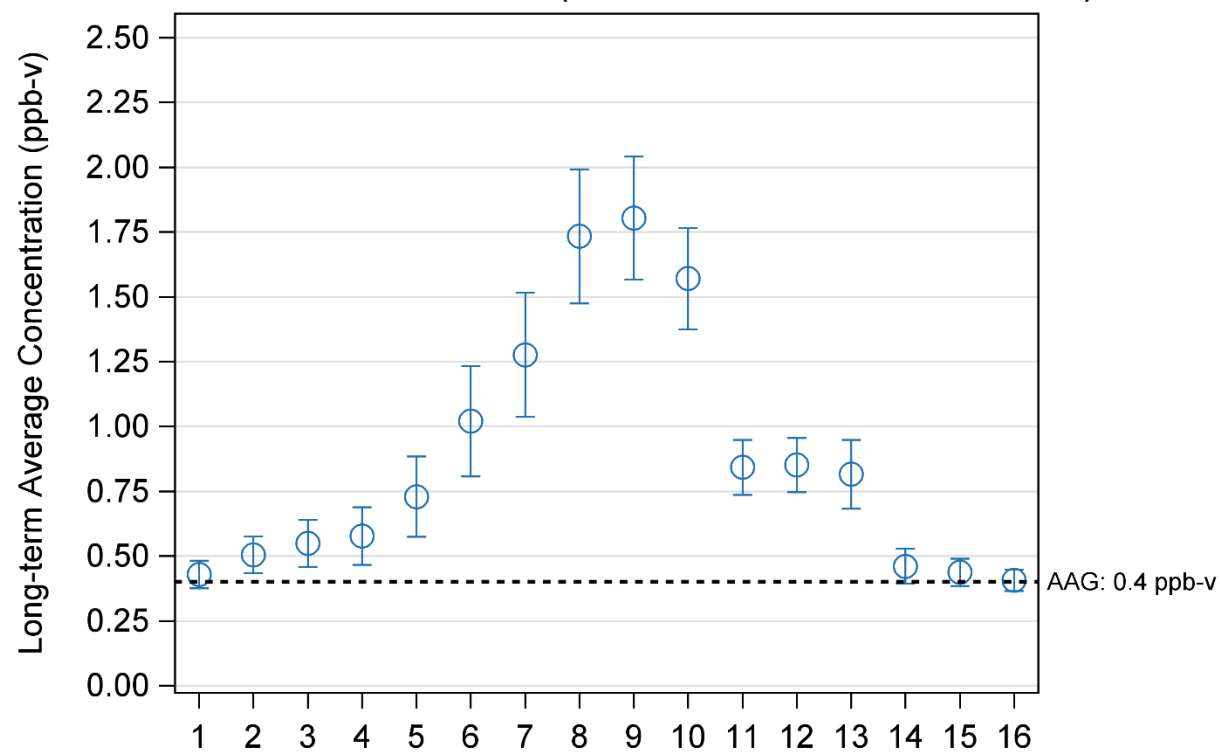


Figure 14: Long-term average benzene concentrations at Sprague South Portland

Figure 15. Long-term average benzene concentrations by monitoring location at Sprague So. Portland (mean & 95% confidence intervals)

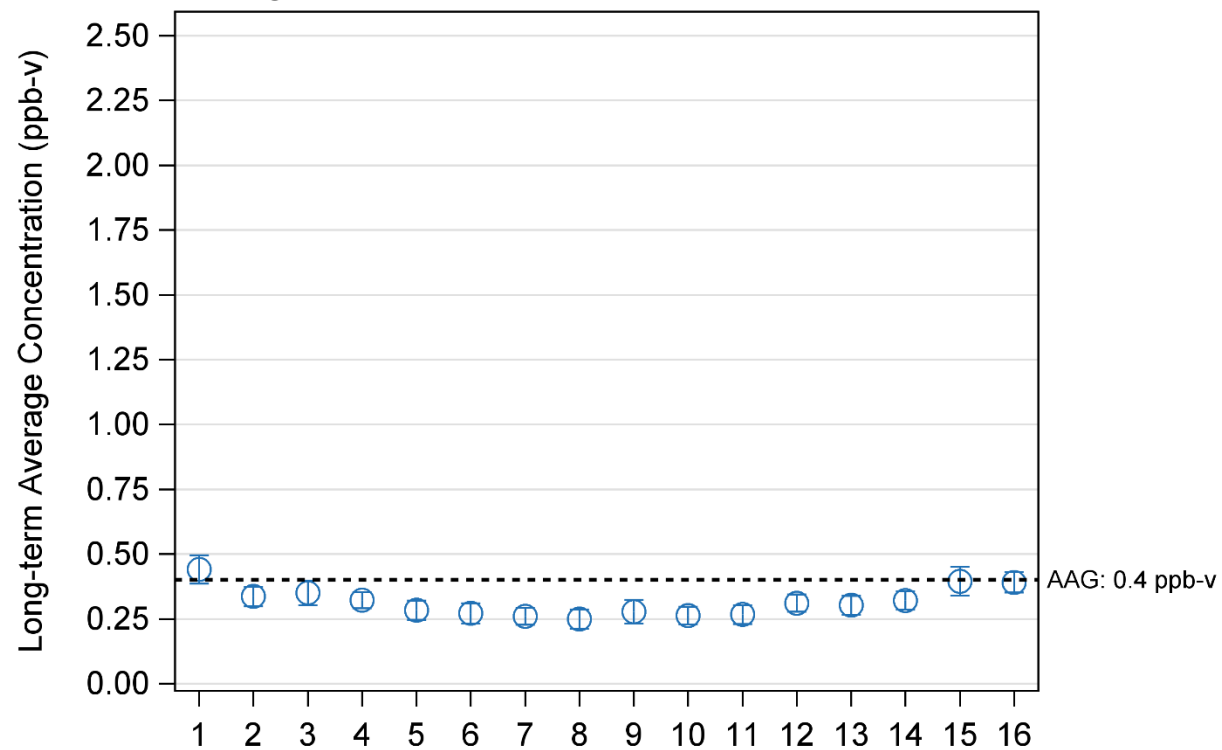


Figure 16: Long-term average benzene concentrations at Sunoco

Figure 17. Long-term average benzene concentrations by monitoring location at Sunoco (mean & 95% confidence intervals)

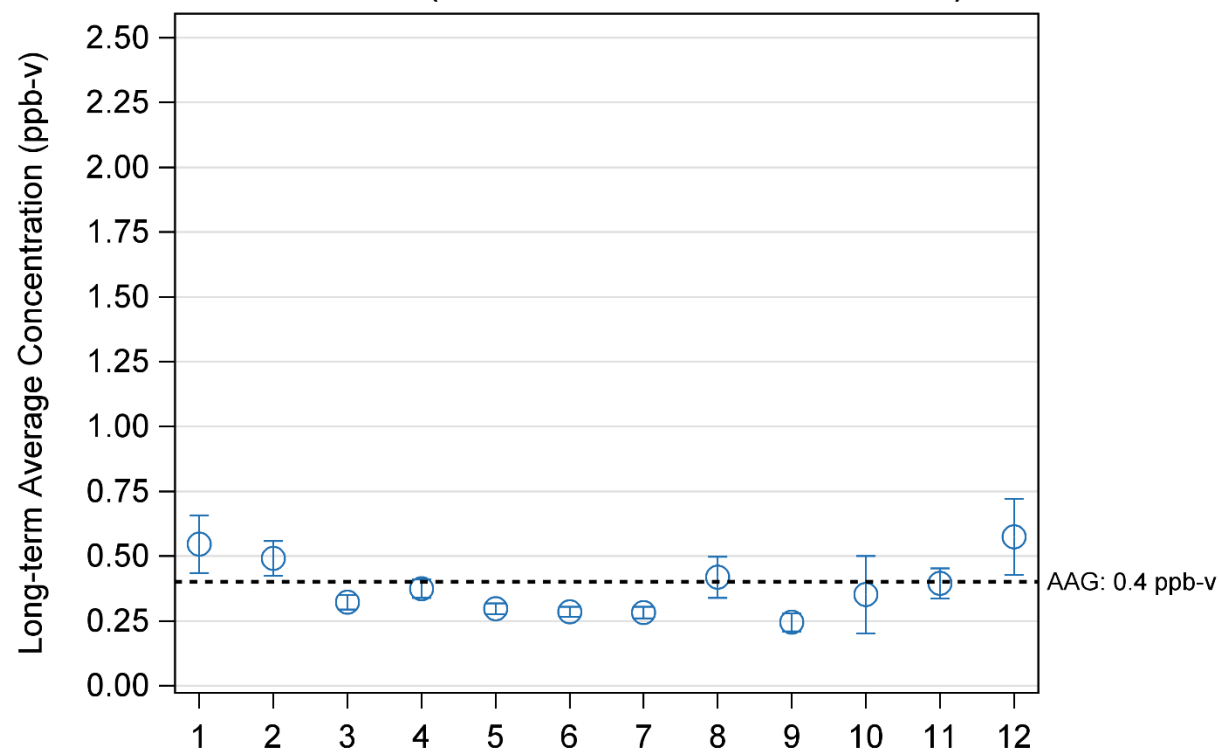


Figure 18: Long-term average benzene concentrations at Irving

Figure 19. Long-term average benzene concentrations by monitoring location at Irving (mean & 95% confidence intervals)

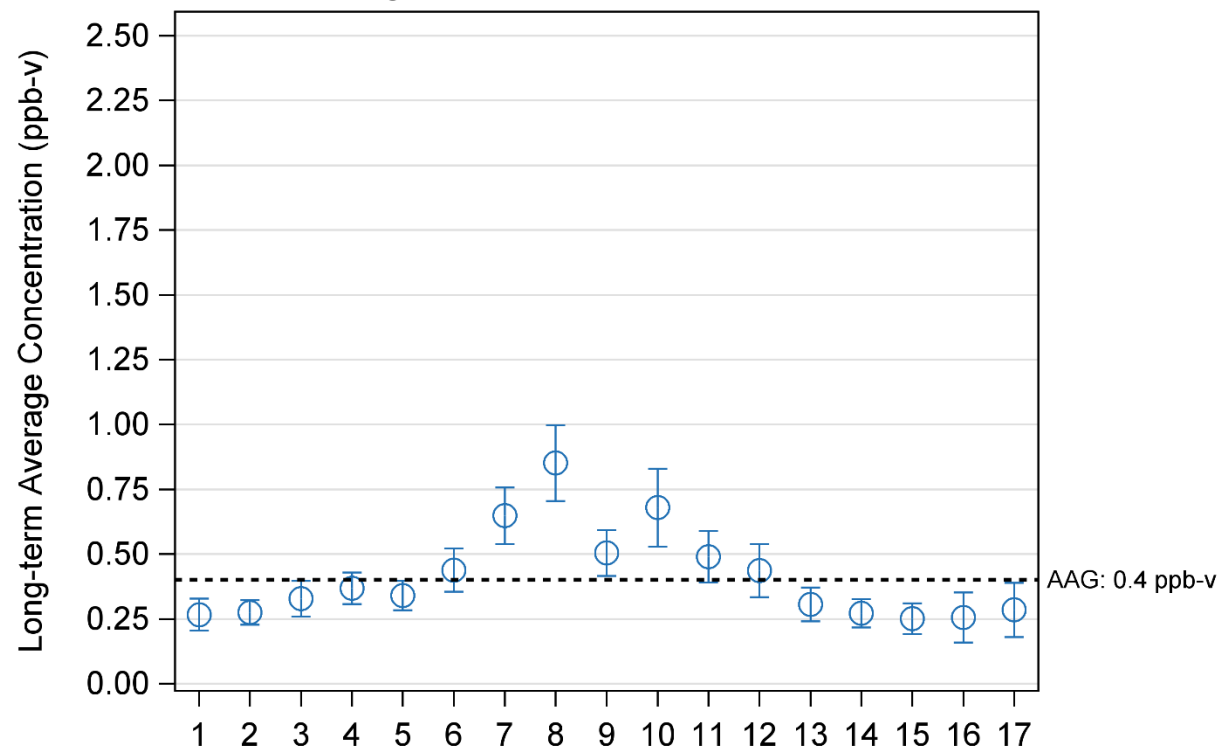


Figure 20: Long-term average benzene concentrations at Sprague Searsport

Figure 21. Long-term average benzene concentrations by monitoring location at Sprague Searsport (mean & 95% confidence intervals)

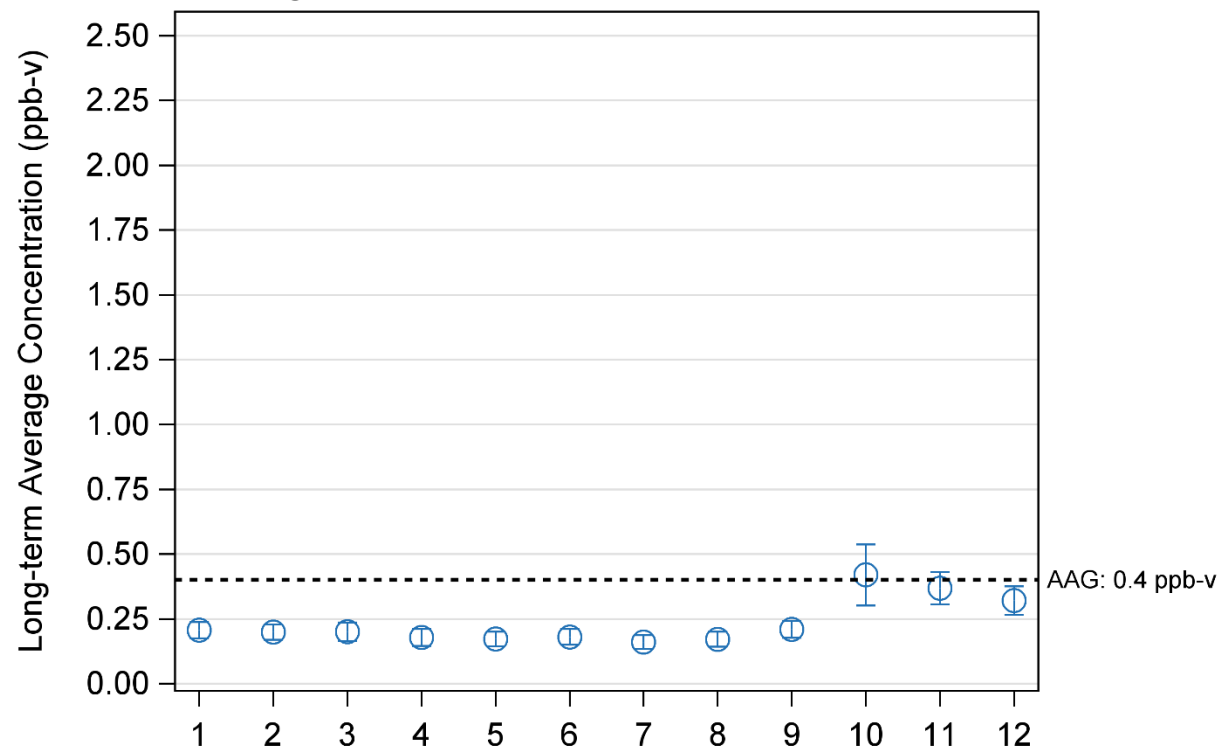


Figure 22: Long-term average benzene concentrations at Penobscot Bay Terminal

Figure 23. Long-term average benzene concentrations by monitoring location at Penobscot Bay Terminal (mean & 95% confidence intervals)

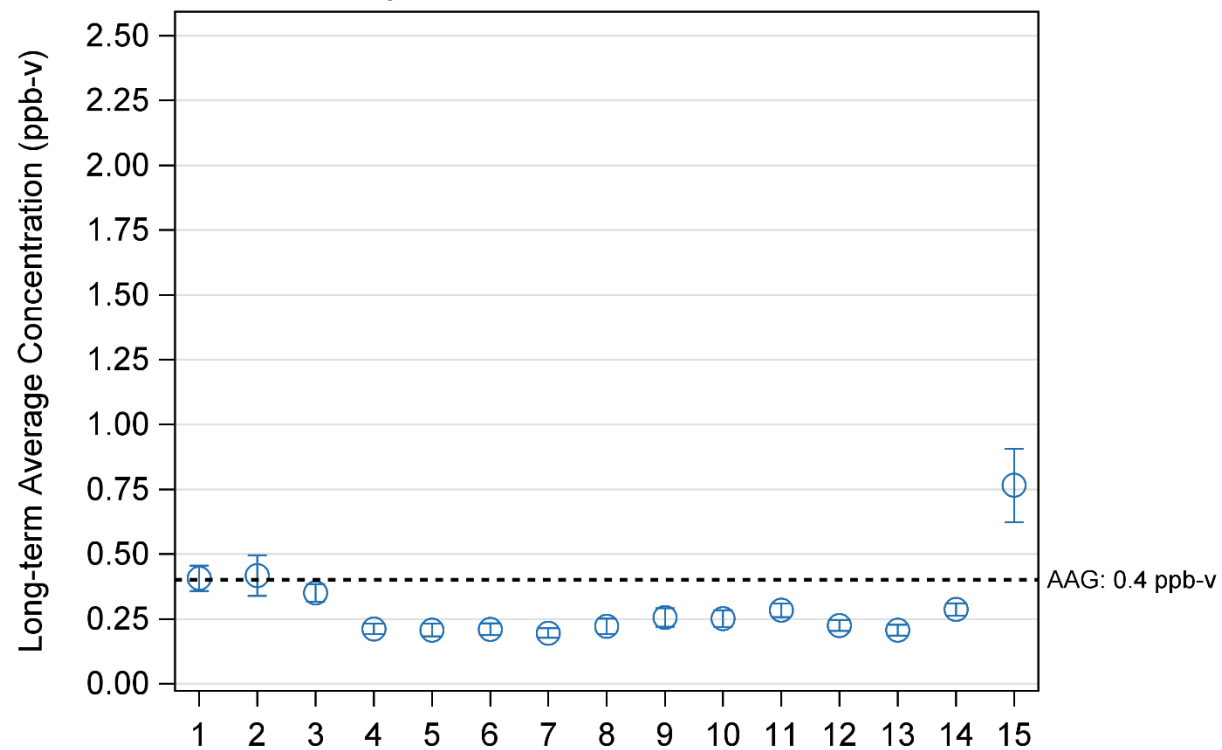


Figure 24: Long-term average benzene concentrations at Cold Brook

Figure 25. Long-term average benzene concentrations by monitoring location at Cold Brook (mean & 95% confidence intervals)

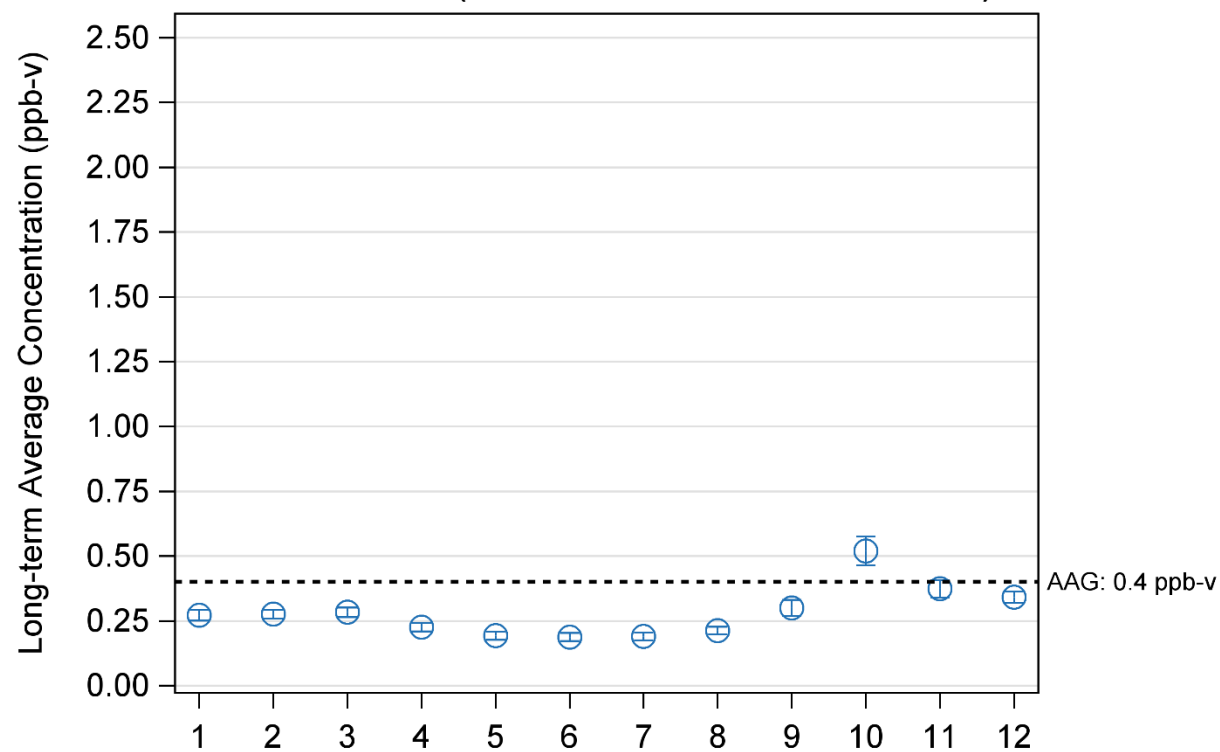
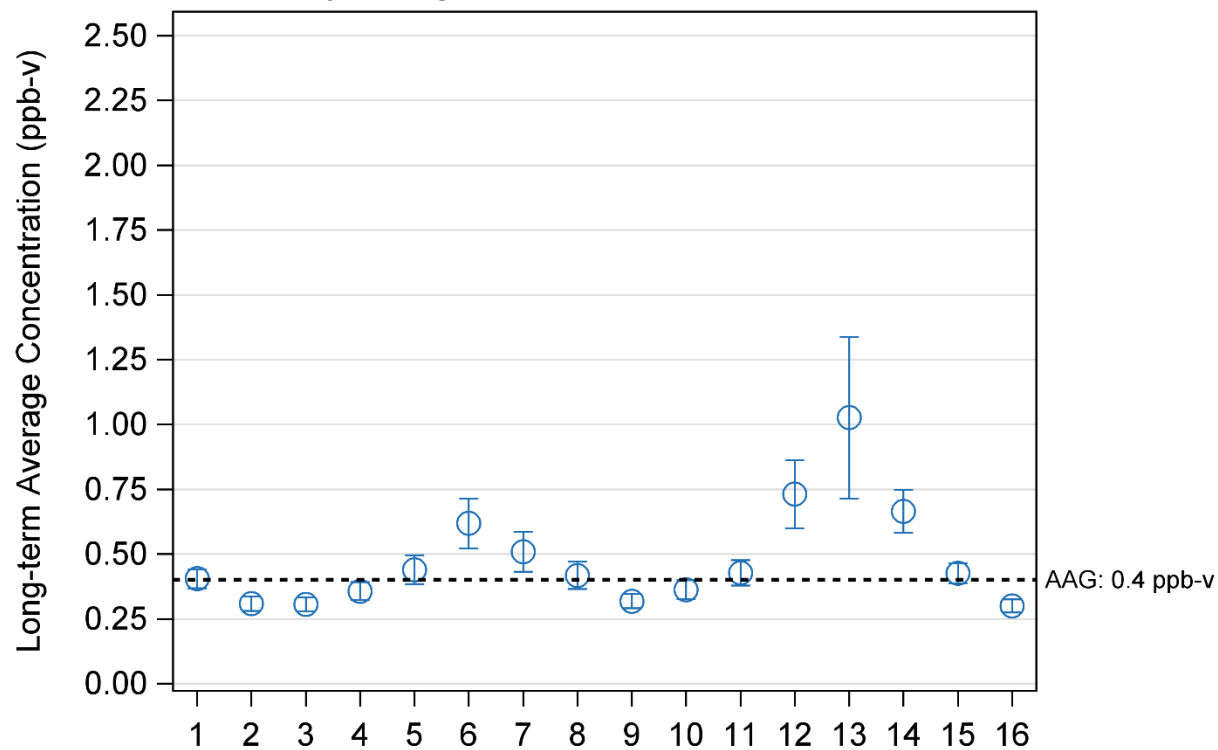


Figure 26: Long-term average benzene concentrations at Buckeye Bangor

Figure 27. Long-term average benzene concentrations by monitoring location at Buckeye Bangor (mean & 95% confidence intervals)



4.3. Individual 14-day Results

In response to continued concerns about potential short-term exposures during more than six years of monitoring conducted as part of the South Portland/Portland VOC Air Quality Monitoring Project, Figures 28 through 31 include the applicable acute MRL as a comparison value for short-term exposure. The MRL is shown as a reference to help readers understand how measured fenceline concentrations compare with the guideline developed for short-term exposure. The figures present all individual 14-day concentration results for each monitored compound—benzene, toluene, ethylbenzene, and xylenes—from each individual sampler along each facility fenceline during the first 1.5 years of fenceline monitoring. These results provide a visual representation of the range of concentrations measured at each facility during the reporting period.

All individual 14-day sample results at all sampling locations for each of the 11 facilities were well below the short-term health guidelines for all compounds.

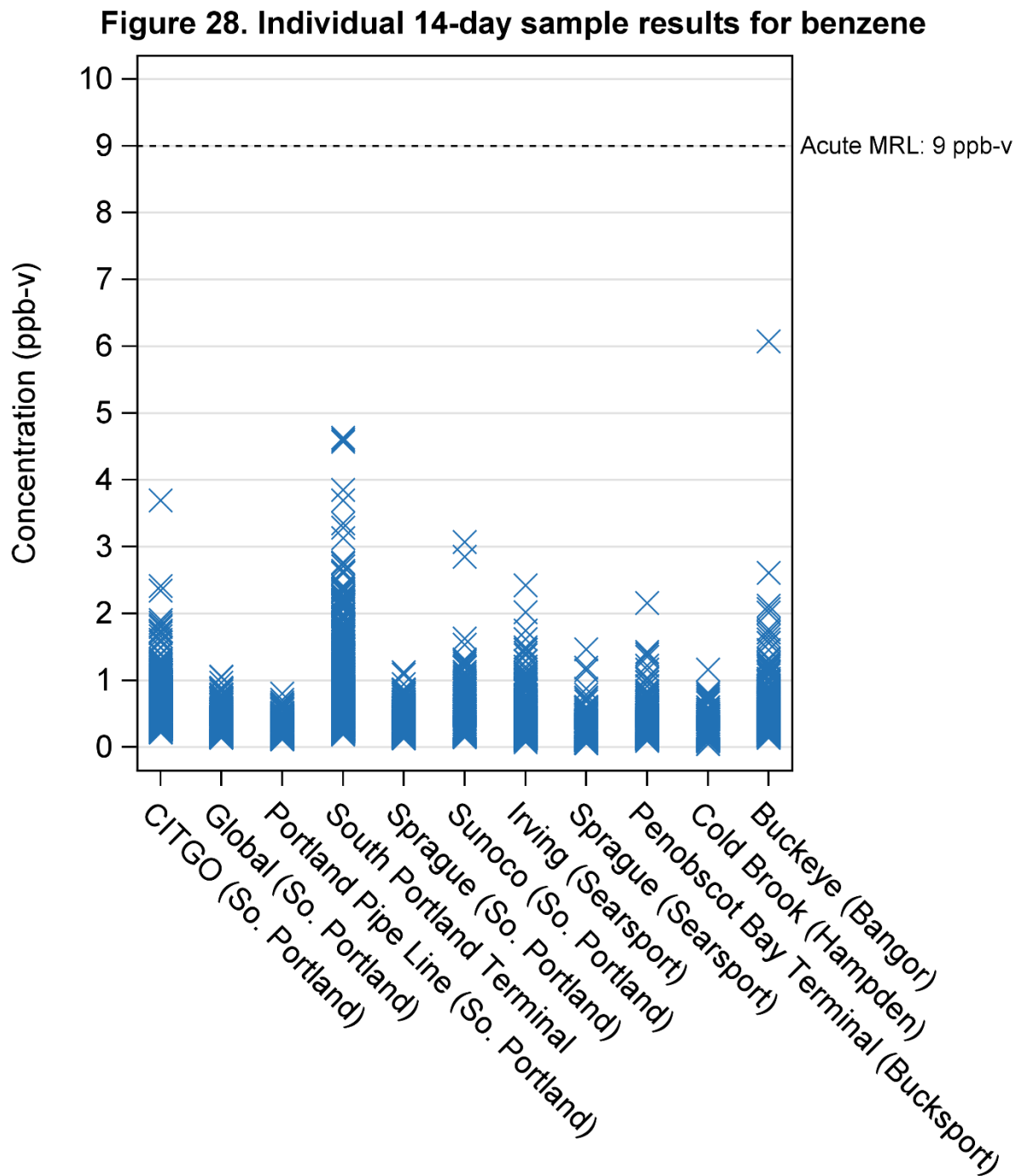


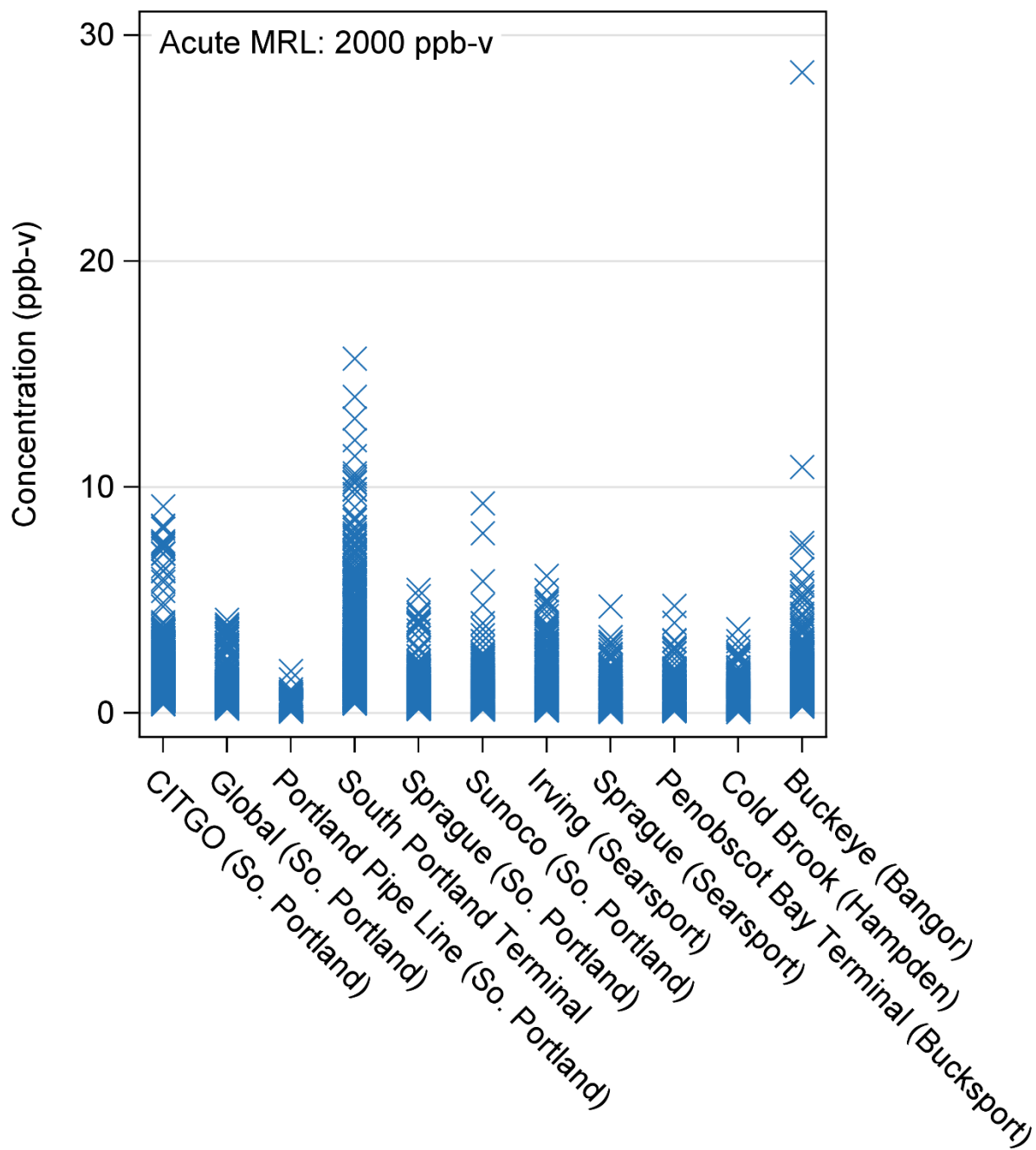
Figure 29. Individual 14-day sample results for toluene

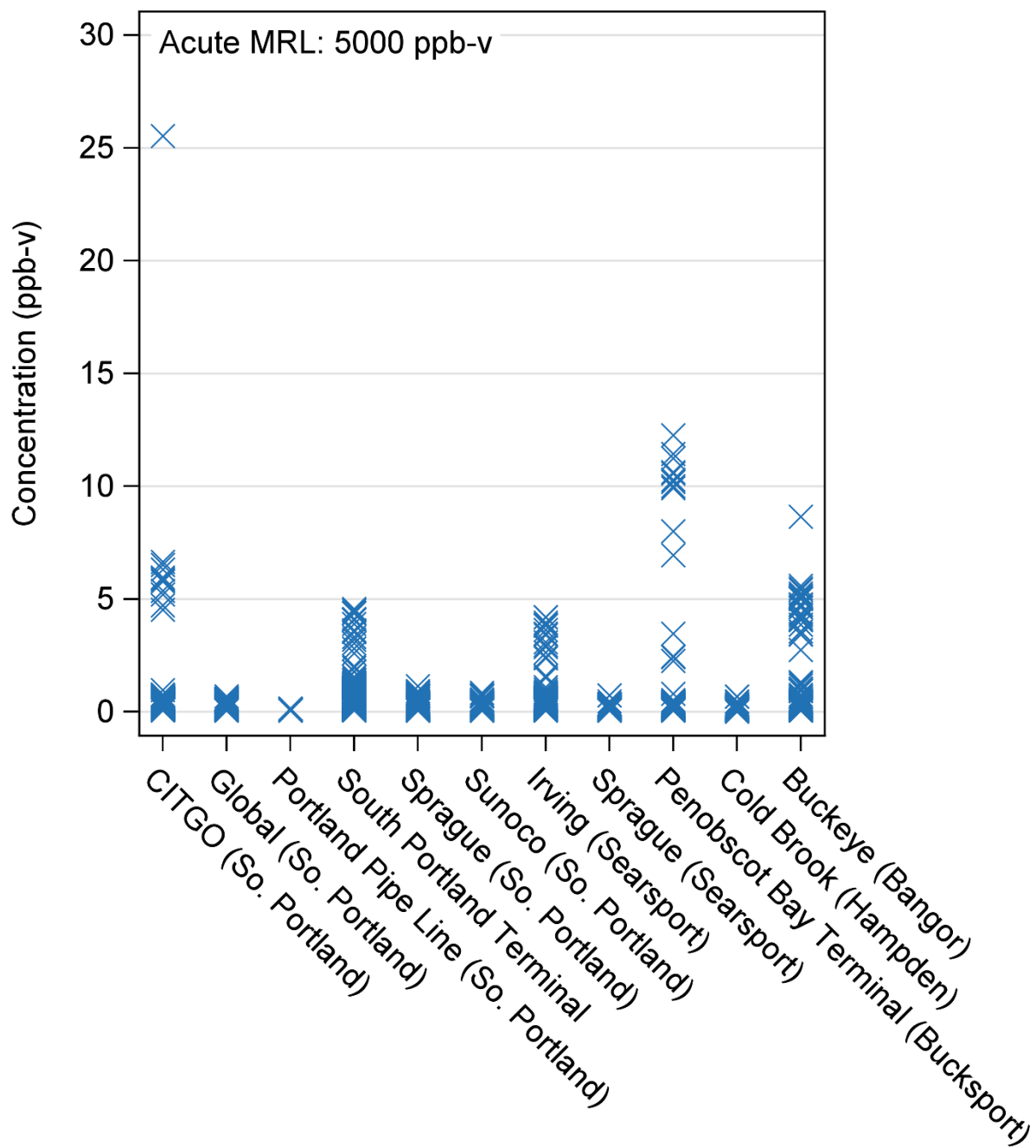
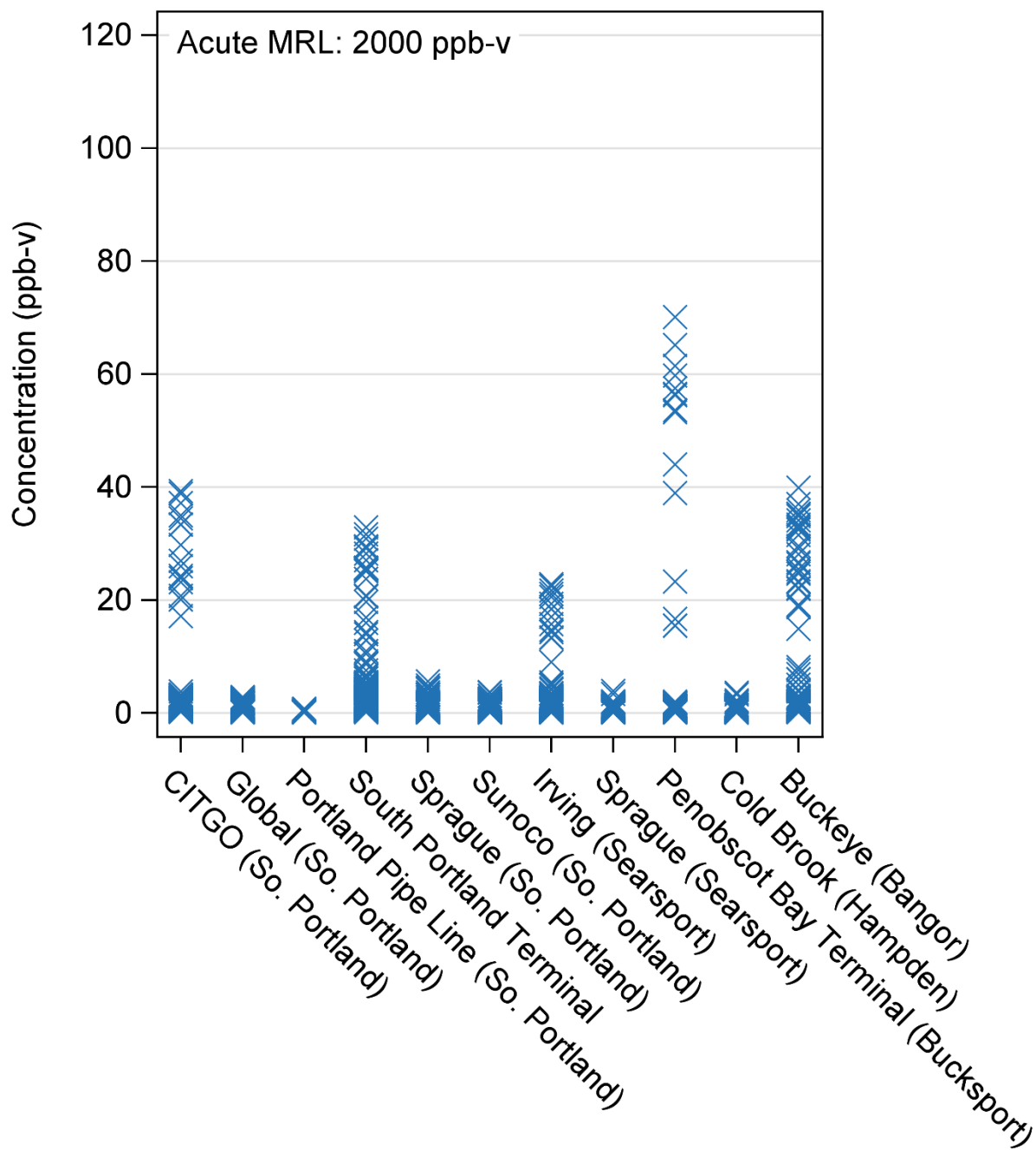
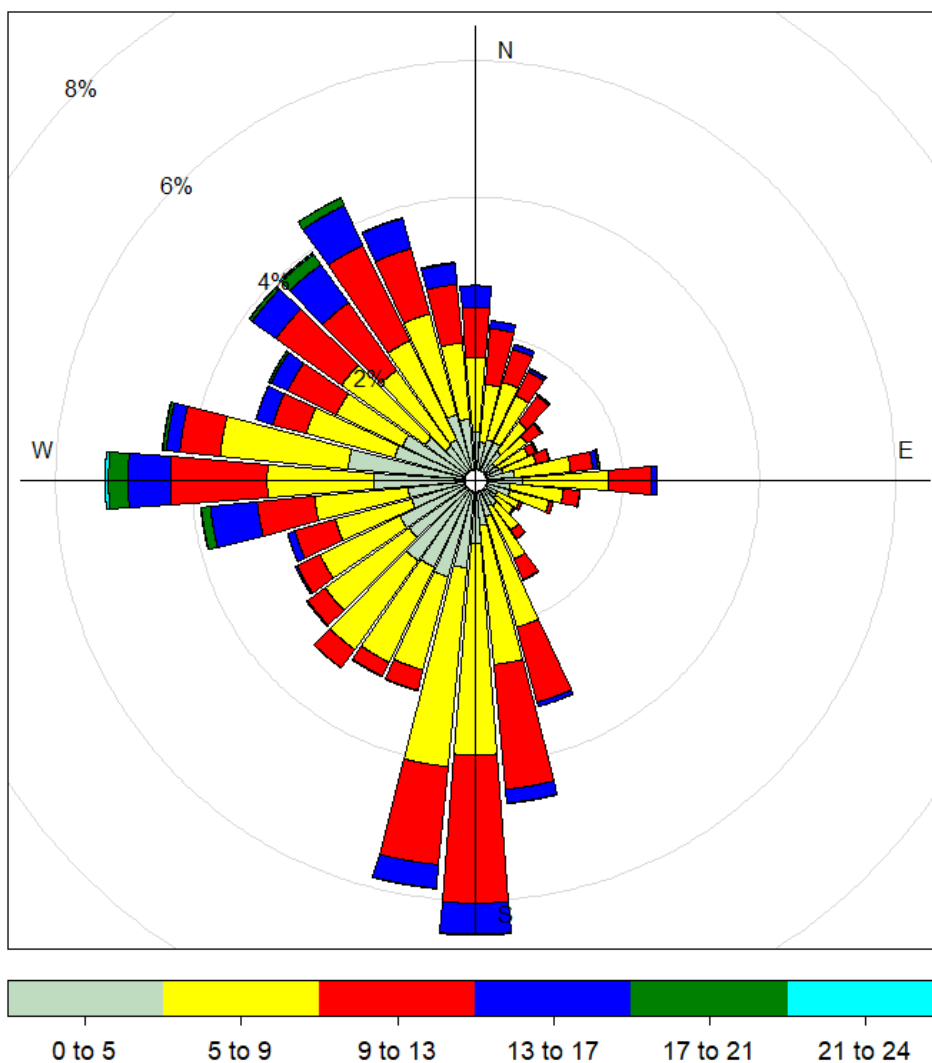
Figure 30. Individual 14-day sample results for ethylbenzene

Figure 31. Individual 14-day sample results for xylenes

4.4. Wind Data

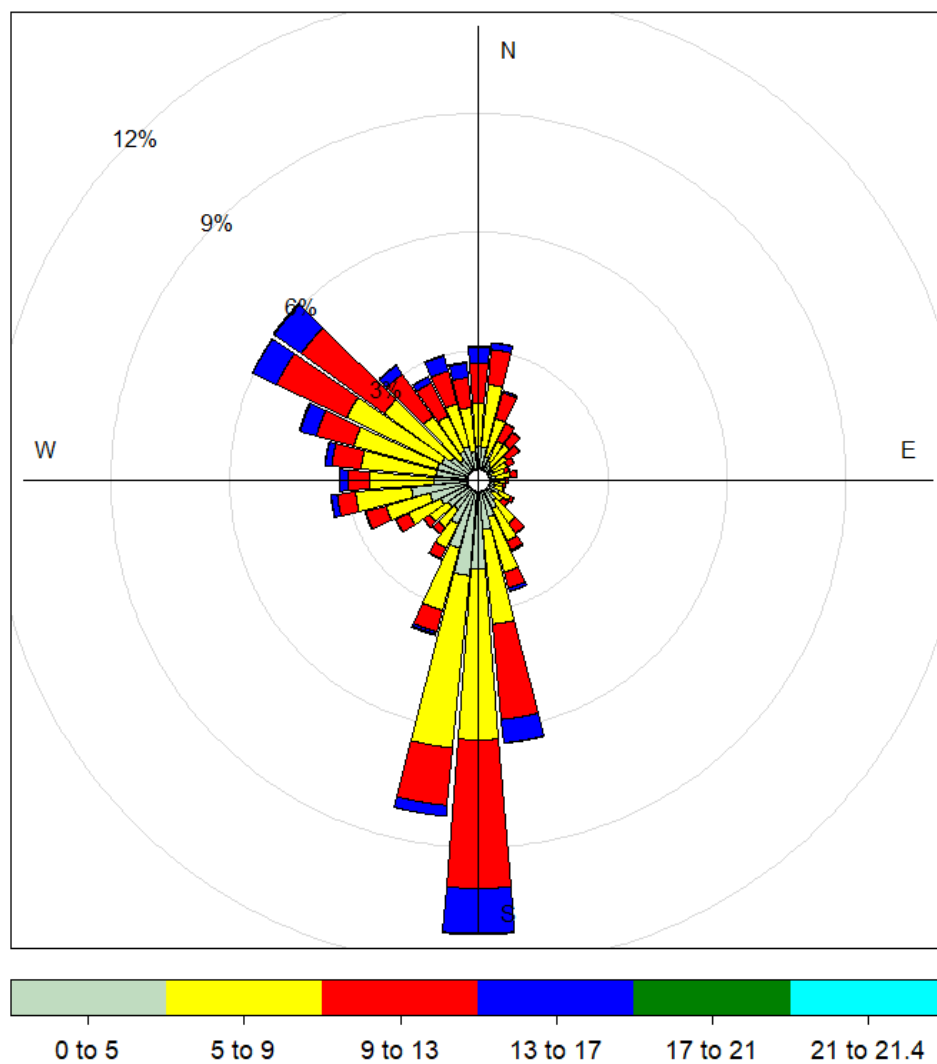
Facilities are required to submit wind data from either Portland International Jetport or Bangor International Airport, whichever is closer to the facility, with each quarterly data report. Figures 32 and 33 present wind data from Portland International Jetport and Bangor International Airport, respectively. Winds at Portland International Jetport are predominantly from the south, with a smaller but notable proportion of winds coming from the west and northwest. Winds at Bangor International Airport show a similar pattern, with southerly winds occurring most frequently and a smaller proportion of winds coming from the northwest. Prevailing wind patterns can provide useful context for interpreting the fenceline monitoring results, particularly when considering how wind direction may influence the movement of emissions from facility sources toward individual monitoring locations. In this data set, however, no clear relationship with wind conditions is evident. A seasonal assessment could provide additional insight, but the current dataset does not include enough seasonal data to evaluate potential trends. This is an investigation the Department will consider for a future report.

**Figure 32. Wind data from Portland International Jetport
(July 1, 2024 – March 31, 2026)**



Wind Speed Breaks (mph)
Mean = 7.72 mph
Calm = 15% (Less than 2 mph)
Missing = 12%

**Figure 33. Wind data from Bangor International Airport
(July 1, 2024 – March 31, 2026)**



Wind Speed Breaks (mph)

Mean = 7.79 mph

Calm = 16% (Less than 2 mph)

Missing = 13%

5. Conclusions

The first 1.5 years of fenceline monitoring provide an initial set of data on Concentrations of benzene, toluene, ethylbenzene, and xylenes measured around Maine petroleum storage facilities subject to Chapter 171. The data provide information on both long-term average concentrations as well as individual 14-day concentrations at locations around each facility.

The long-term results varied by compound and facility. Long-term average concentrations of toluene and xylenes were below their applicable AAGs at all facilities. Ethylbenzene concentrations were below the AAG at most facilities; however, at three facilities, one monitoring location at each facility had a long-term average concentration that was slightly above or near the applicable AAG. Benzene had the greatest number of monitoring locations with long-term average concentrations above the AAG. Portland Pipe Line was the only facility where benzene concentrations were below the AAG at all monitoring locations; each of the other facilities had at least one monitoring location with a long-term average concentration above the AAG. Benzene concentrations also varied among monitoring locations at many facilities. The facility-specific maps and graphs in this report show where higher concentrations were measured and how those results compare with the AAG for benzene. These results provide additional information about the distribution of benzene concentrations around individual facilities and may help identify areas for further evaluation.

All individual 14-day concentrations measured for the four monitored VOCs were below the ATSDR acute MRLs.

The AAG and ATSDR MRL comparisons should be considered in light of the limitations of the fenceline monitoring data. Specifically, the AAGs are intended to evaluate chronic exposure and are based on conservative assumptions of continuous exposure (24 hours a day, 7 days a week) over a full 70-year lifetime. The fenceline monitoring data do not directly measure long-term exposure for people living near a facility.

Concentrations at nearby homes or other locations may differ from those measured at the fenceline depending on factors such as distance, wind direction, atmospheric conditions, and other site-specific factors. A fenceline concentration above an AAG does not mean that a nearby person is exposed to that concentration or that the exposure would result in an adverse health effect.

These results of this analysis indicate that benzene concentrations exceeded the AAG at some fenceline monitoring locations. Although AAGs are not regulatory standards, they provide a benchmark for identifying locations that may warrant further investigation. For locations near residential homes in South Portland where average benzene concentrations exceeded the AAG, the Department is evaluating the need for additional monitoring beyond certain facility fencelines and closer to nearby residential homes. As fenceline monitoring continues, additional data will provide a longer-term record of conditions around these facilities. Continued monitoring and any additional analyses will help the Department evaluate changes in concentrations over time and determine whether the patterns observed during this initial monitoring period persist in future results.

6. Appendix A: Excluded Data

Quality control flags are not unusual in environmental monitoring data; however, several duplicate sample results reviewed for this analysis showed RPDs substantially greater than the 30% threshold. For example, a batch of samples collected at South Portland Terminal in December 2024 included two duplicate samples. The first had RPDs of 160% for ethylbenzene, 160% for m,p-xylene, and 150% for o-xylene. The second had RPDs of 150% for ethylbenzene, 160% for m,p-xylene, and 150% for o-xylene. Similarly, a March 2025 batch from Sprague (Searsport) had RPDs of 68% for toluene, 95% for ethylbenzene, 130% for m,p-xylene, and 140% for o-xylene in one duplicate. The second duplicate had RPDs of 47% for ethylbenzene, 44% for m,p-xylene, and 52% for o-xylene. The same target analytes—toluene, ethylbenzene, m,p-xylene, and o-xylene—were also qualified for field blank contamination.

Table A1. Percentage of samples excluded from analysis

Facility	Benzene	Toluene	Ethylbenzene	Xylenes
CITGO (So. Portland)	3	10	30	29
Global (So. Portland)	7	17	40	36
Portland Pipe Line (So. Portland)	5	34	0	9
South Portland Terminal	1	23	18	22
Sprague (So. Portland)	2	17	34	35
Sunoco (So. Portland)	2	2	2	6
Irving (Searsport)	14	36	33	35
Sprague (Searsport)	11	36	31	32
Penobscot Bay Terminal (Bucksport)	6	25	37	39
Cold Brook (Hampden)	1	2	1	4
Buckeye (Bangor)	2	10	32	27

In addition to data excluded related to duplicate or blank quality, a series of field errors occurred during Q4 2025 that resulted in significant data loss for the quarter at Penobscot Bay Terminal, Irving, and Sprague (Searsport). Penobscot Bay Terminal

reported missing samples from 10/9/25 to 10/23/25. The samples from 9/25/25 were analyzed outside of the allowable holding time (30 days), and samples from 11/6/25 were collected after the allowable collection window (14+/-1 days). Irving and Sprague (Searsport) both reported missing samples from 10/16/25 as well as samples from 11/5/25 having been collected outside of the allowable window. For samples collected and/or analyzed outside the method-specified time window, facilities included results in an informational appendix. These informational results as well as all missing samples were not included in the Department's data quality review or data analysis.

7. Appendix B: Results in $\mu\text{g}/\text{m}^3$

Figure 2B. Long-term average concentrations of benzene by individual monitor at each facility compared to the AAG

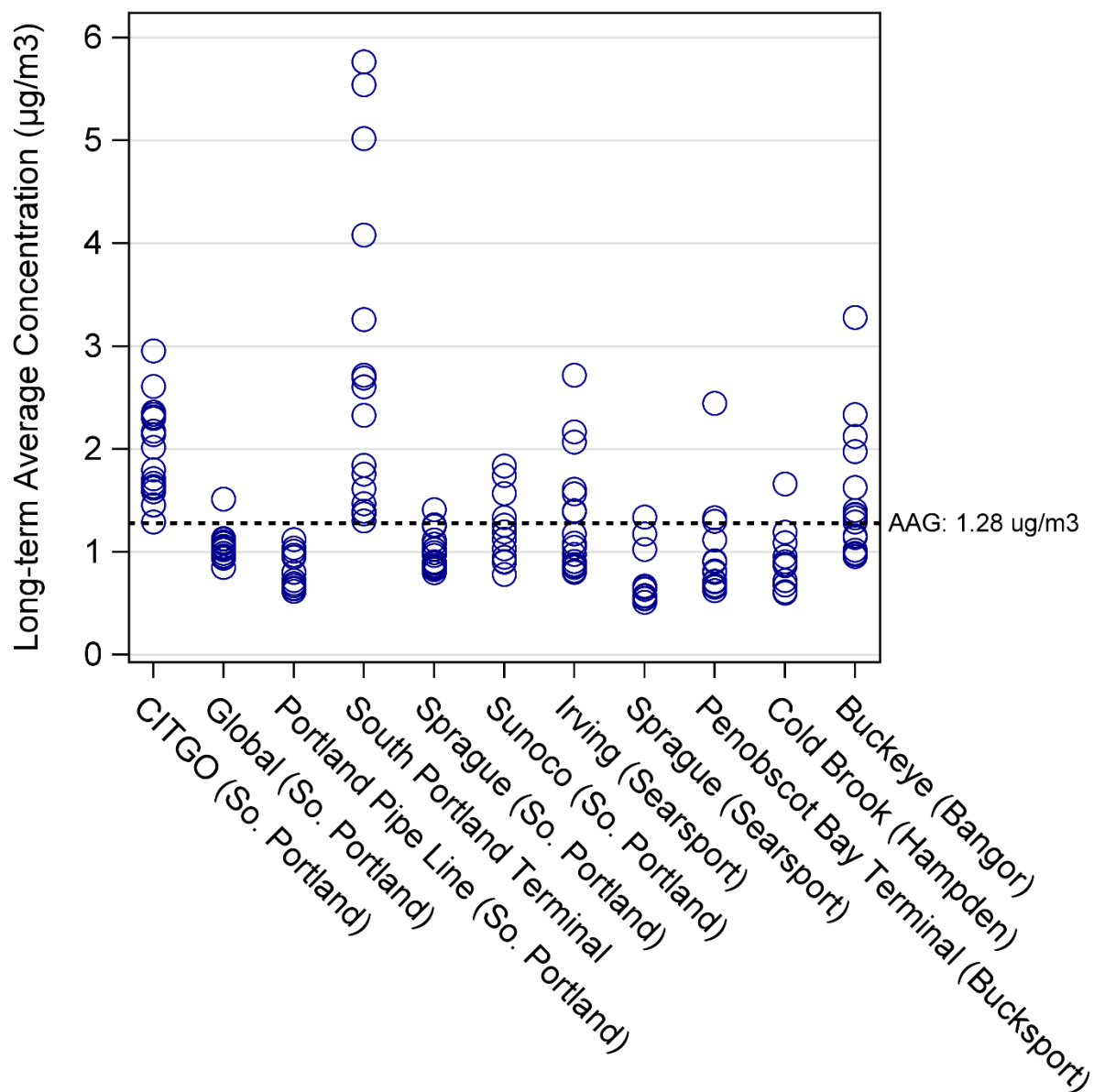


Figure 3B. Long-term average concentrations of toluene by individual monitor at each facility compared to the AAG

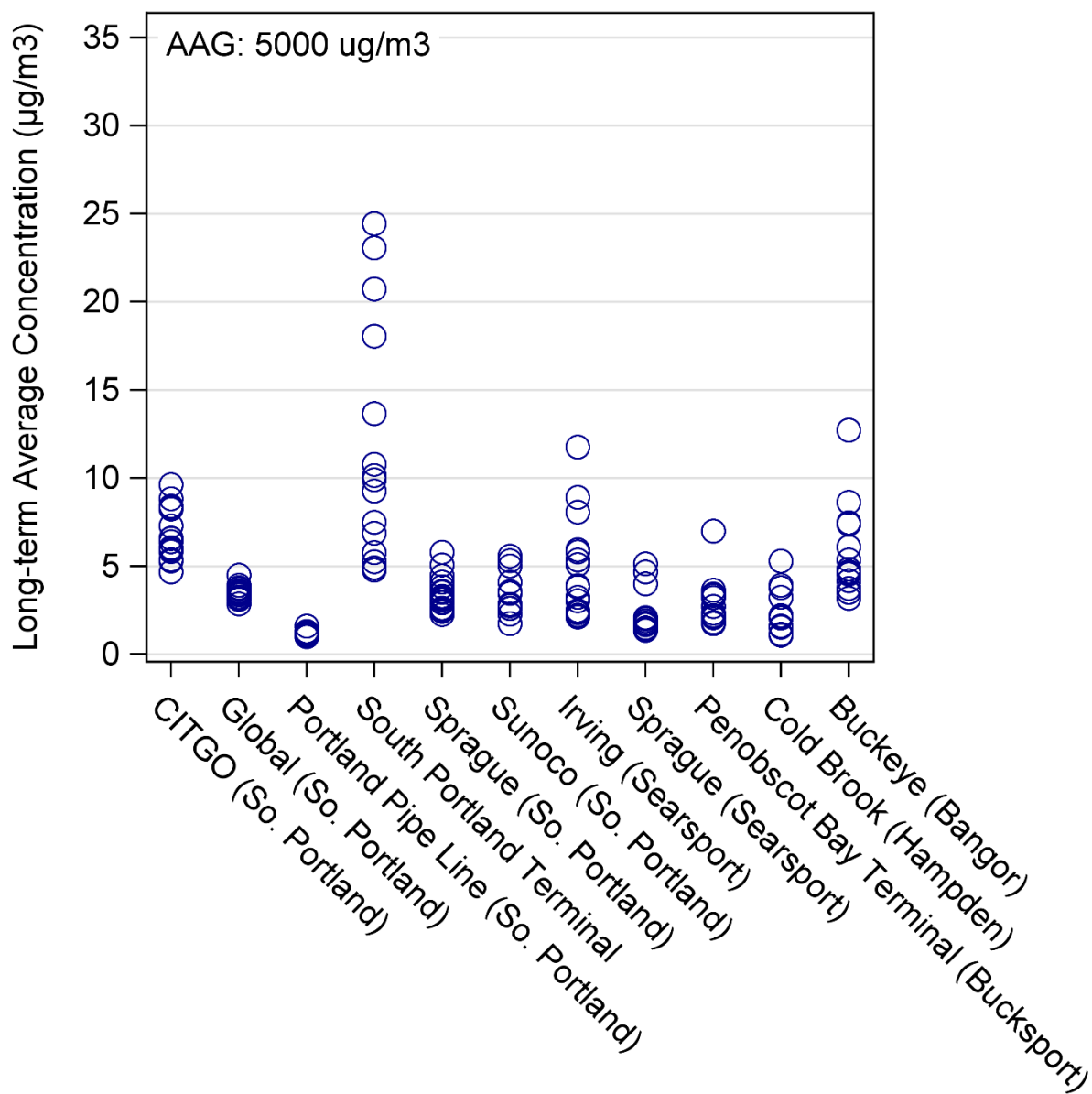


Figure 4B. Long-term average concentrations of ethylbenzene by individual monitor at each facility compared to the AAG

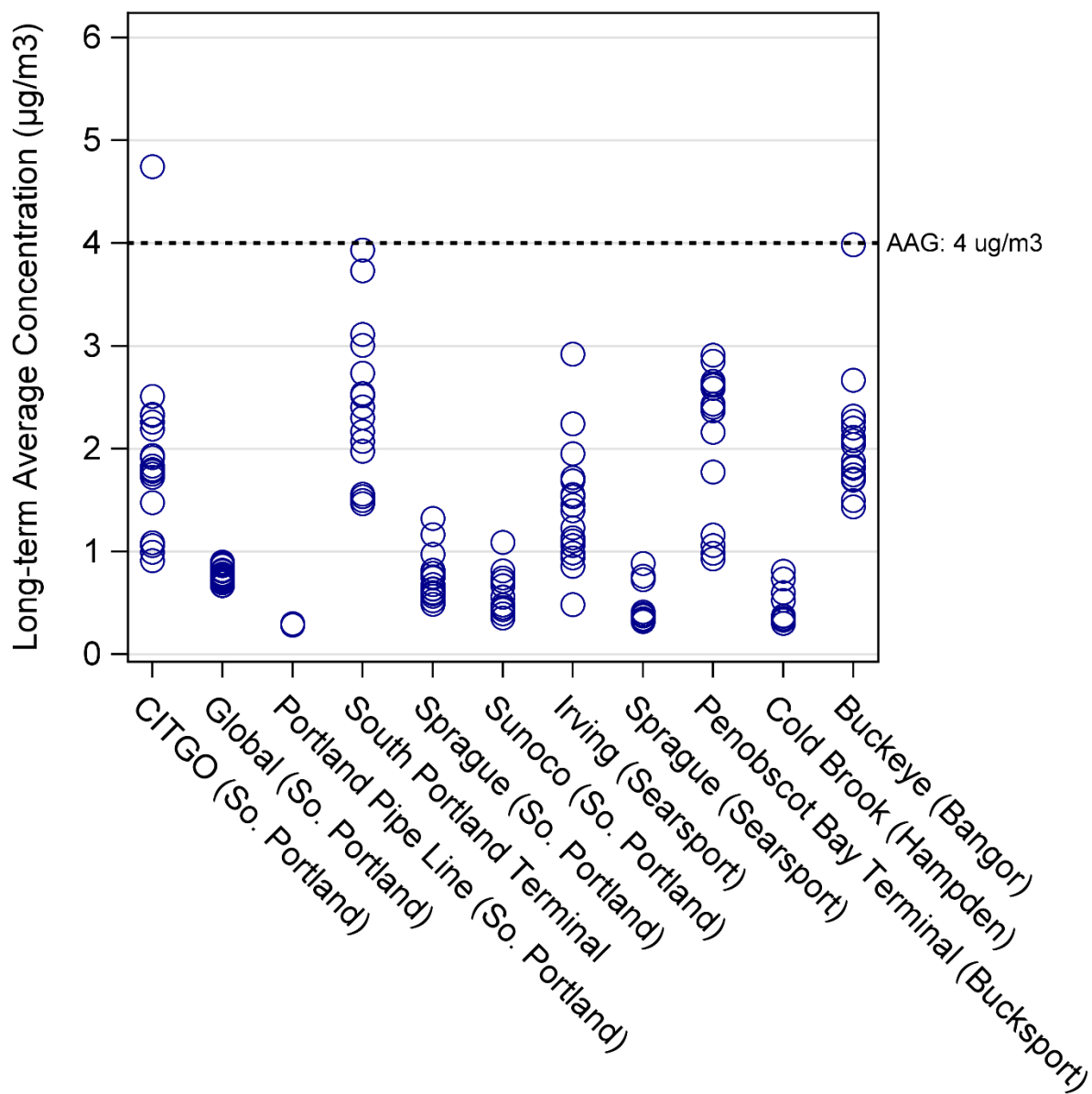


Figure 5B. Long-term average concentrations of xylenes by individual monitor at each facility compared to the AAG

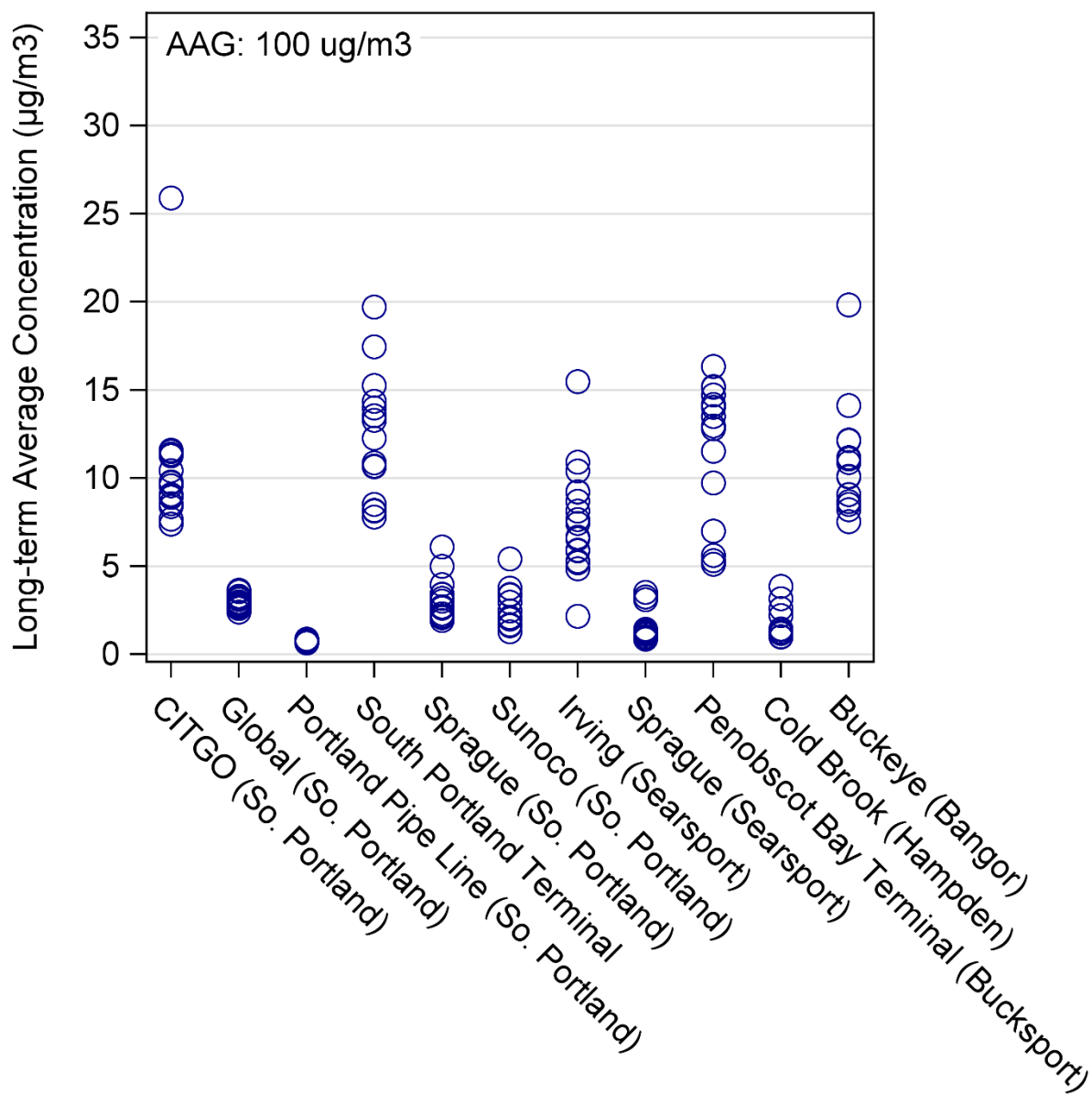


Figure 7B. Long-term average benzene concentrations by monitoring location at CITGO (mean & 95% confidence intervals)

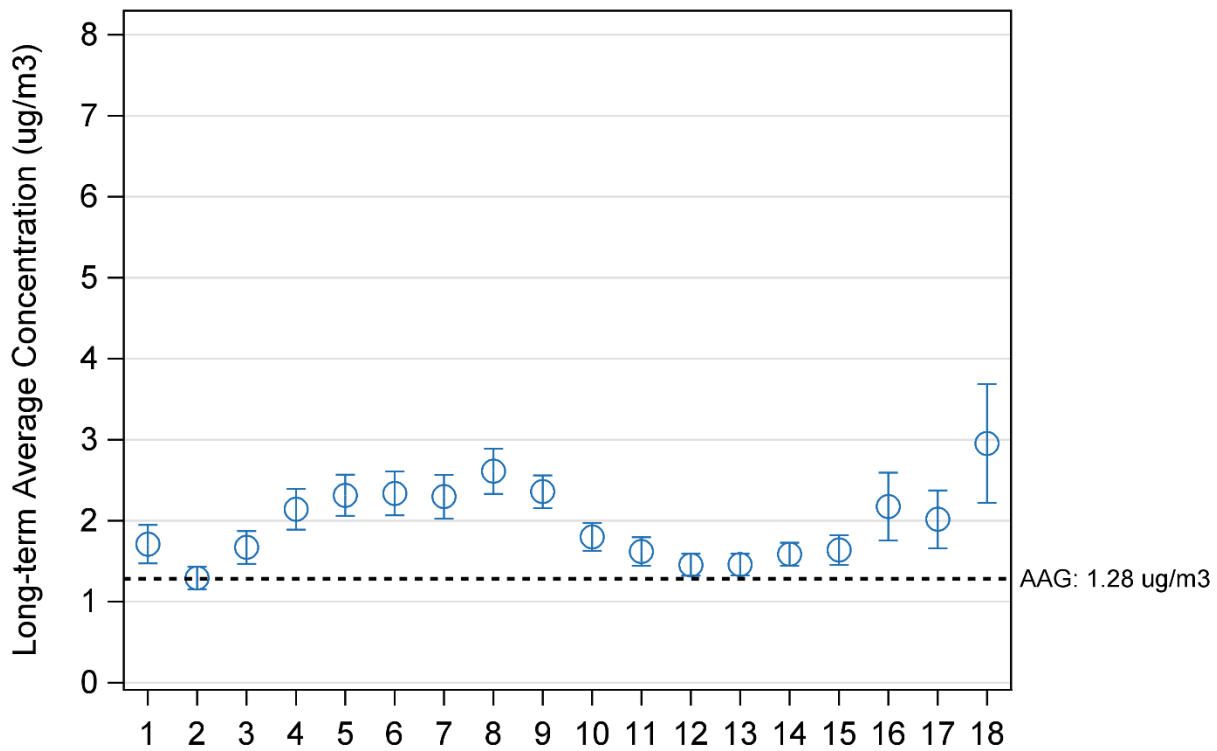


Figure 9B. Long-term average benzene concentrations by monitoring location at Global (mean & 95% confidence intervals)

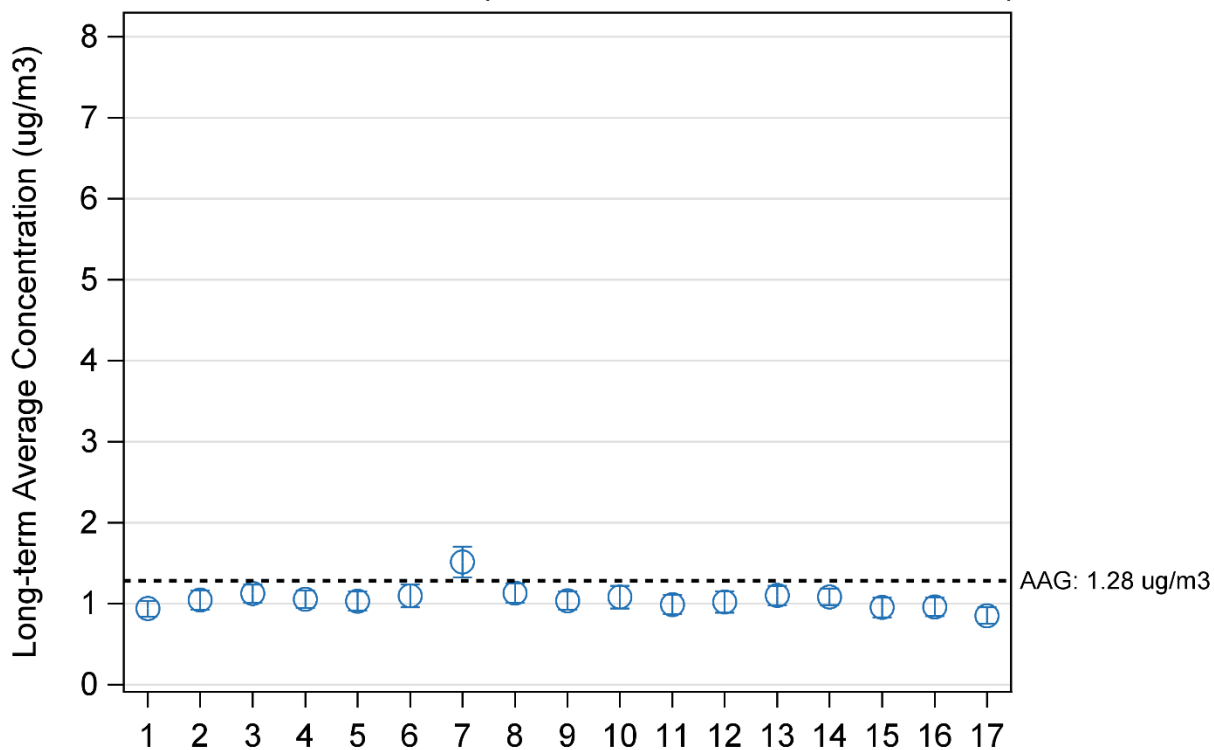


Figure 11B. Long-term average benzene concentrations by monitoring location at Portland Pipe Line (mean & 95% confidence intervals)

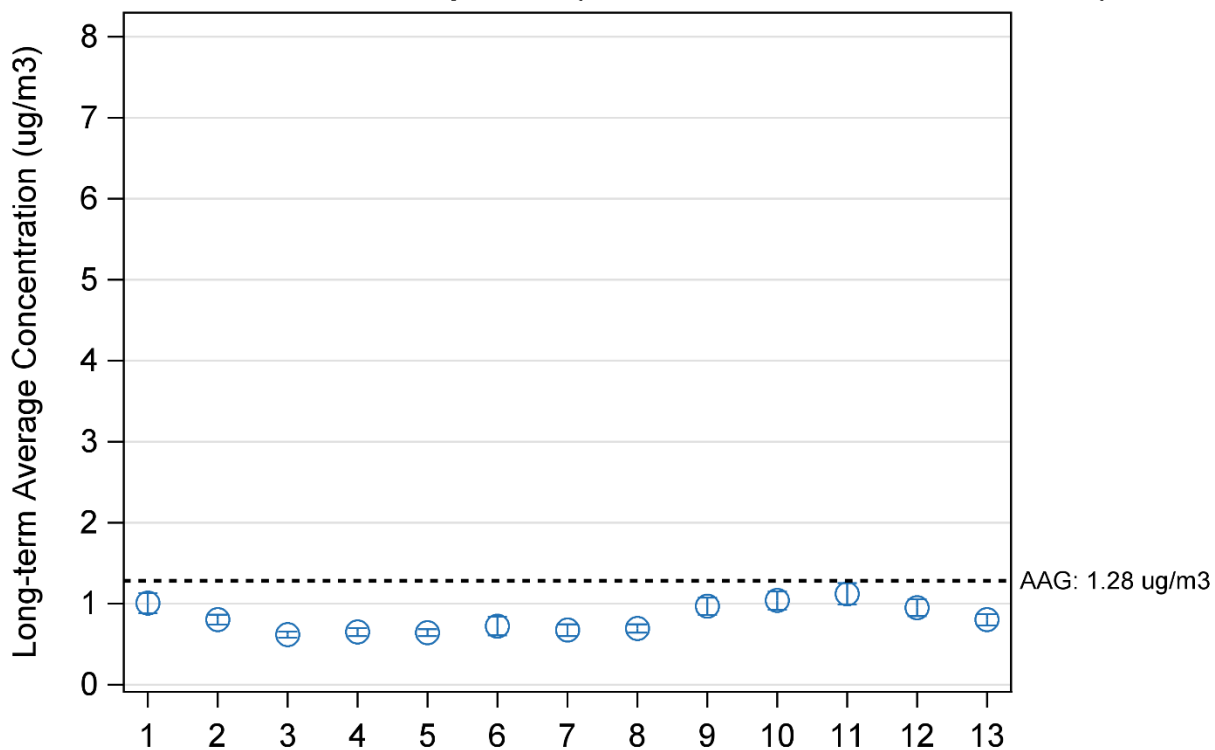


Figure 13B. Long-term average benzene concentrations by monitoring location at South Portland Terminal (mean & 95% confidence intervals)

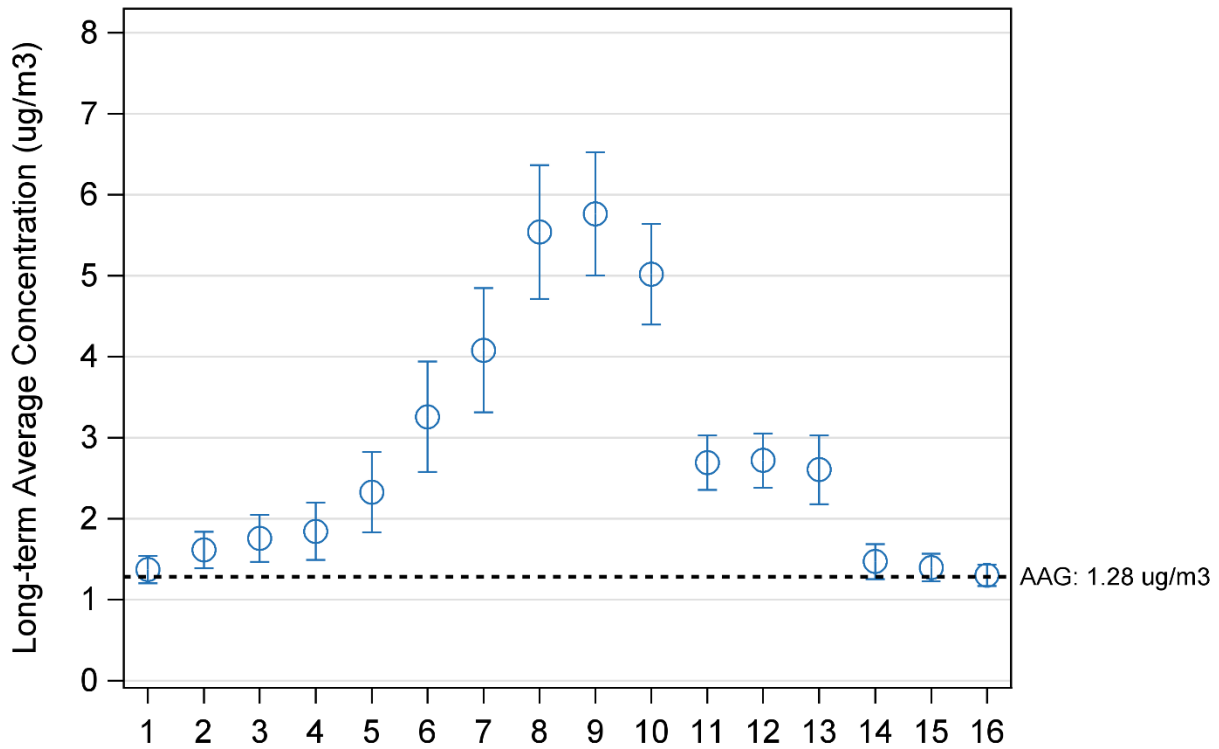


Figure 15B. Long-term average benzene concentrations by monitoring location at Sprague So. Portland (mean & 95% confidence intervals)

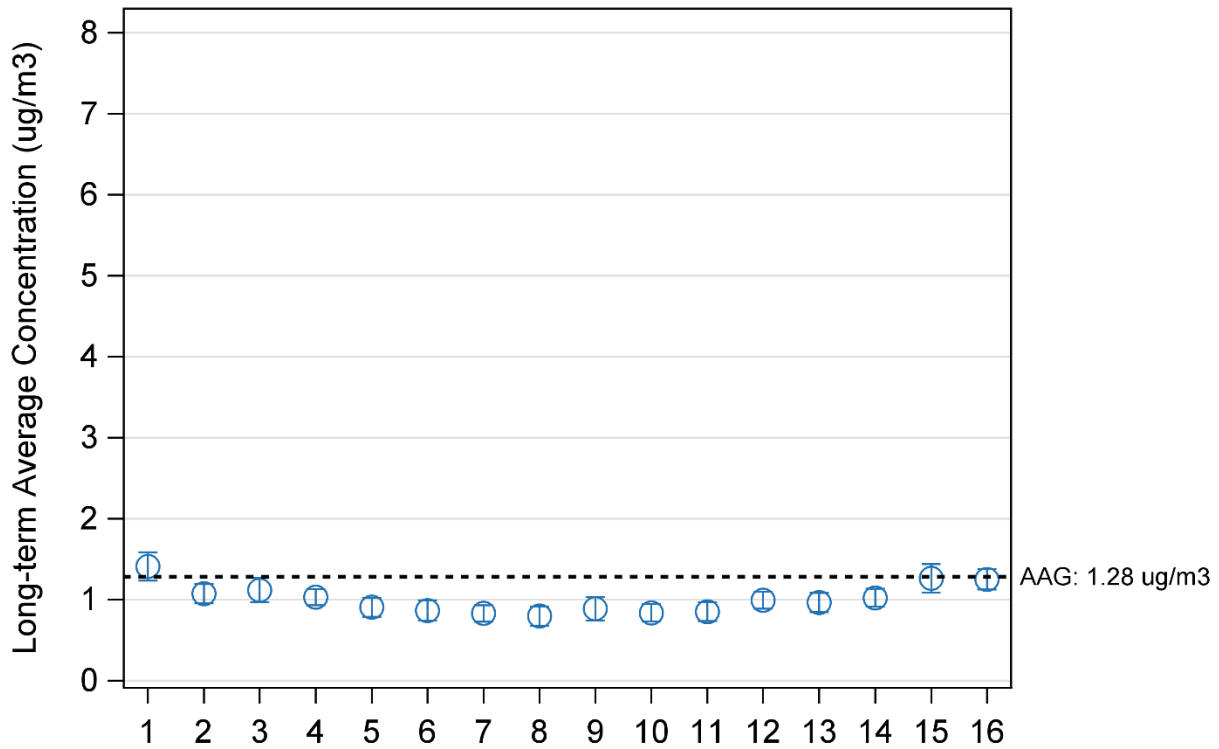


Figure 17B. Long-term average benzene concentrations by monitoring location at Sunoco (mean & 95% confidence intervals)

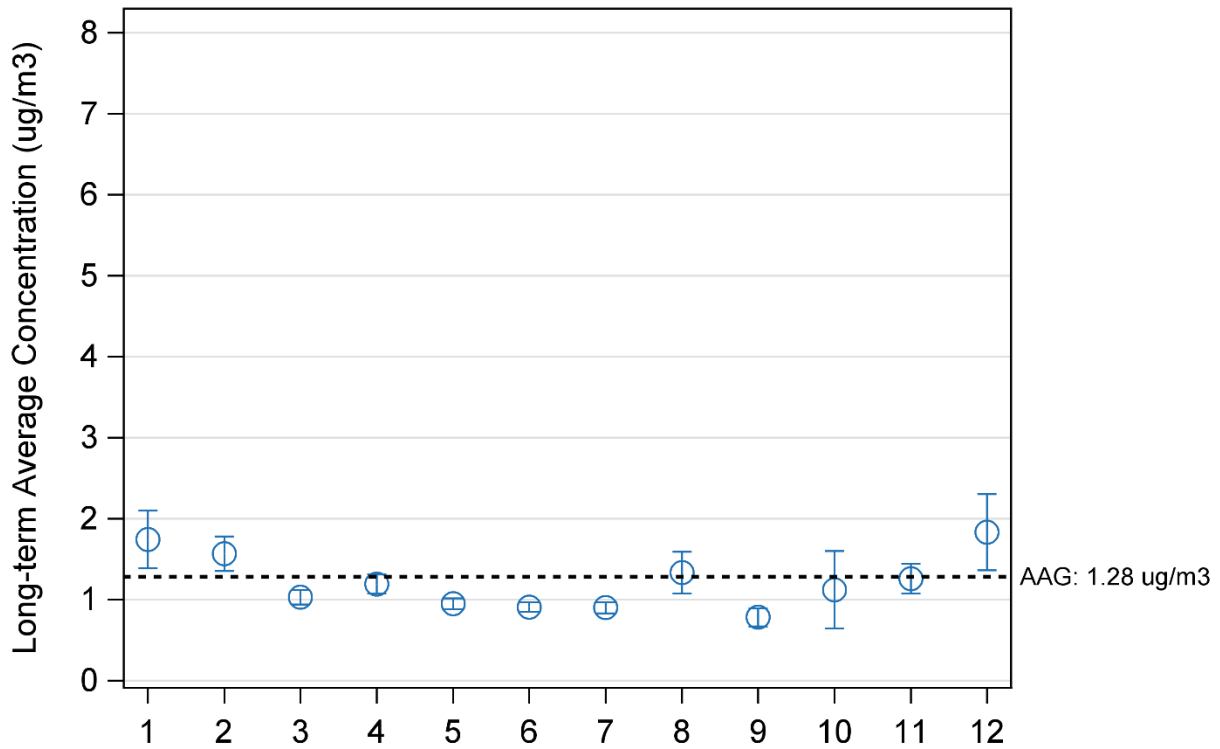


Figure 19B. Long-term average benzene concentrations by monitoring location at Irving (mean & 95% confidence intervals)

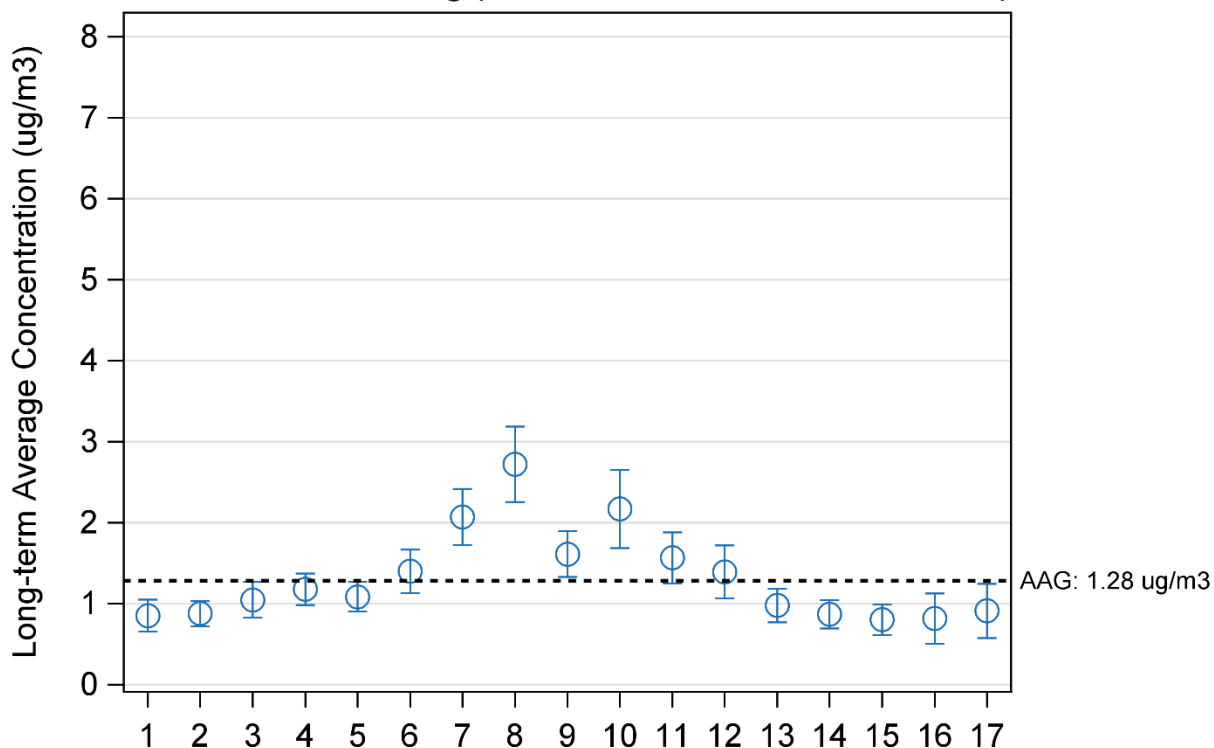


Figure 21B. Long-term average benzene concentrations by monitoring location at Sprague Searsport (mean & 95% confidence intervals)

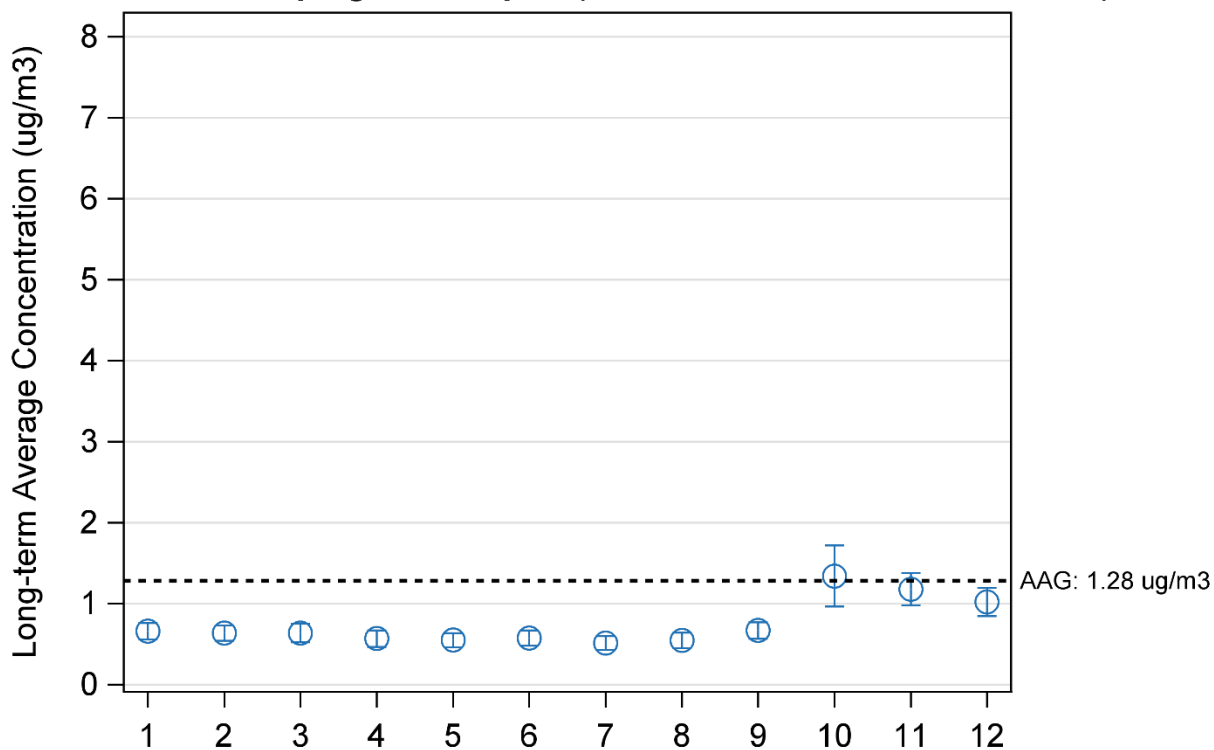


Figure 23B. Long-term average benzene concentrations by monitoring location at Penobscot Bay Terminal (mean & 95% confidence intervals)

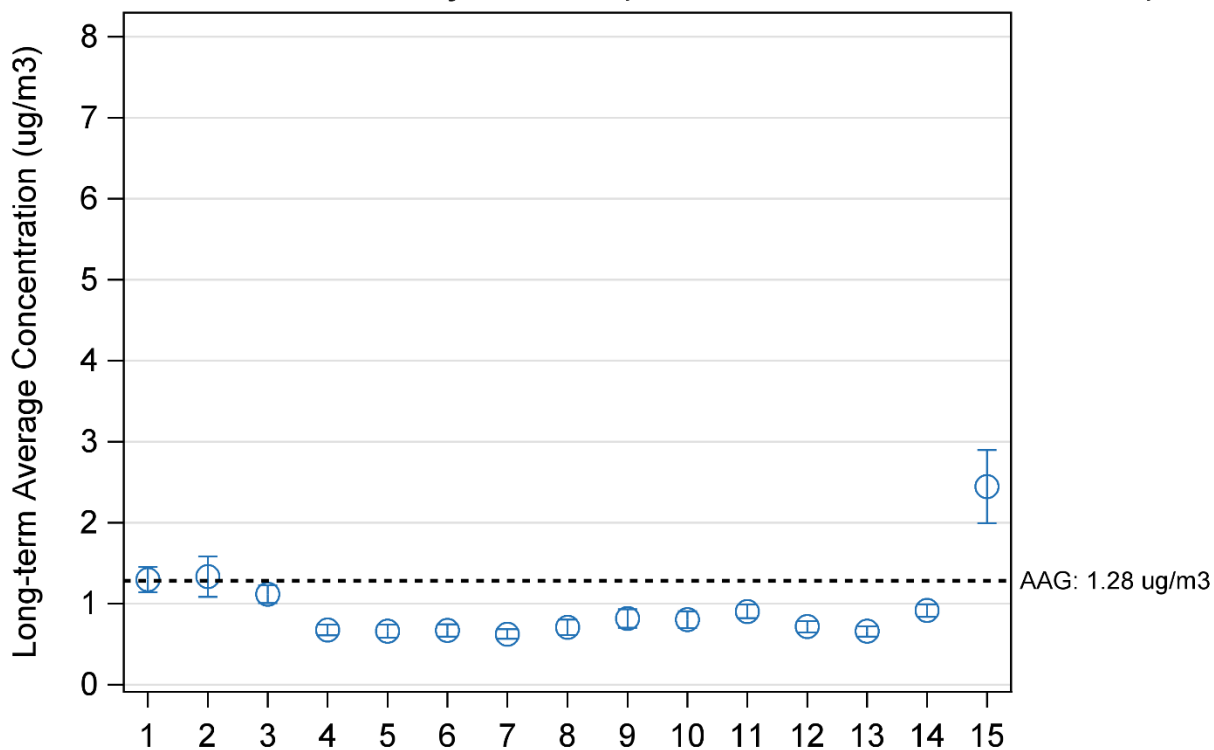


Figure 25B. Long-term average benzene concentrations by monitoring location at Cold Brook (mean & 95% confidence intervals)

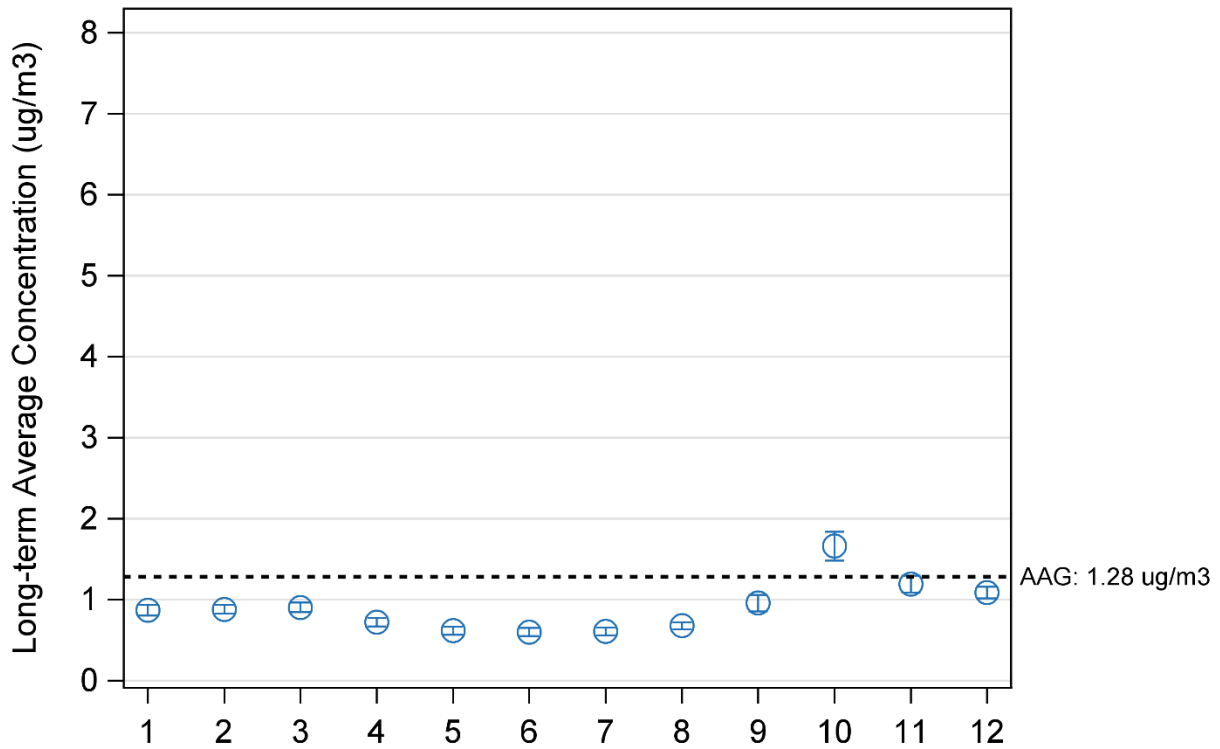
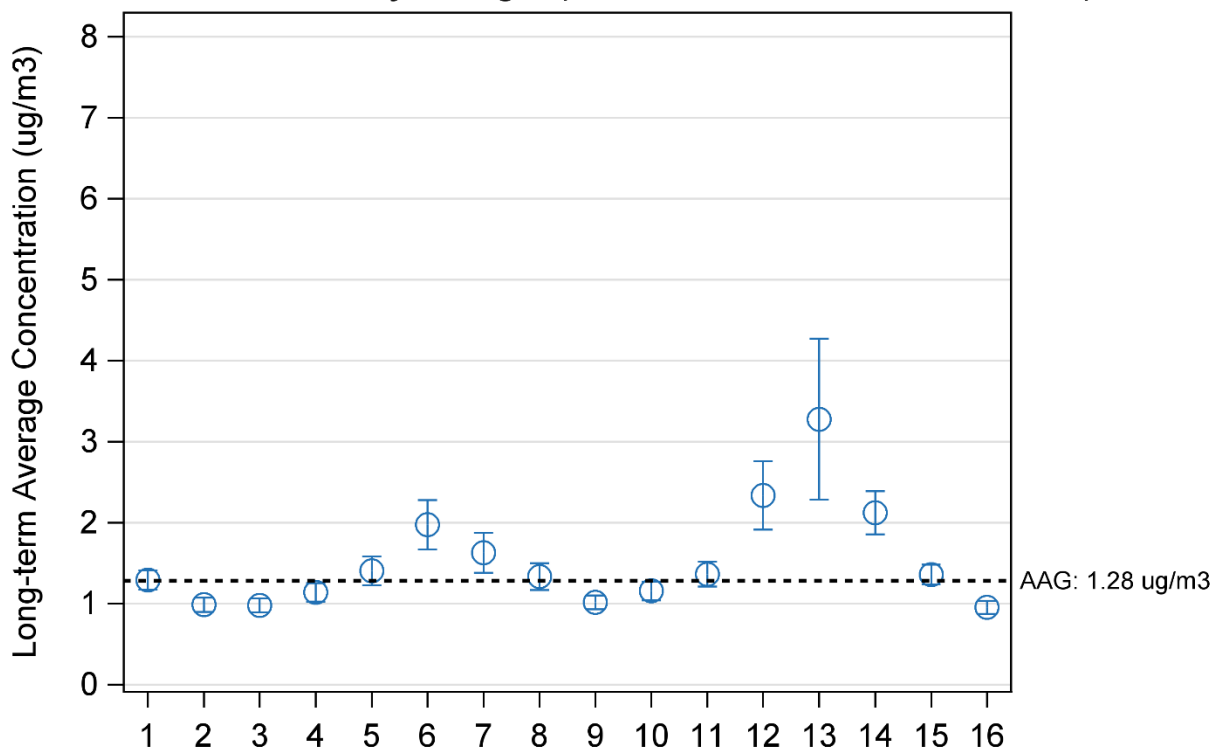


Figure 27B. Long-term average benzene concentrations by monitoring location at Buckeye Bangor (mean & 95% confidence intervals)



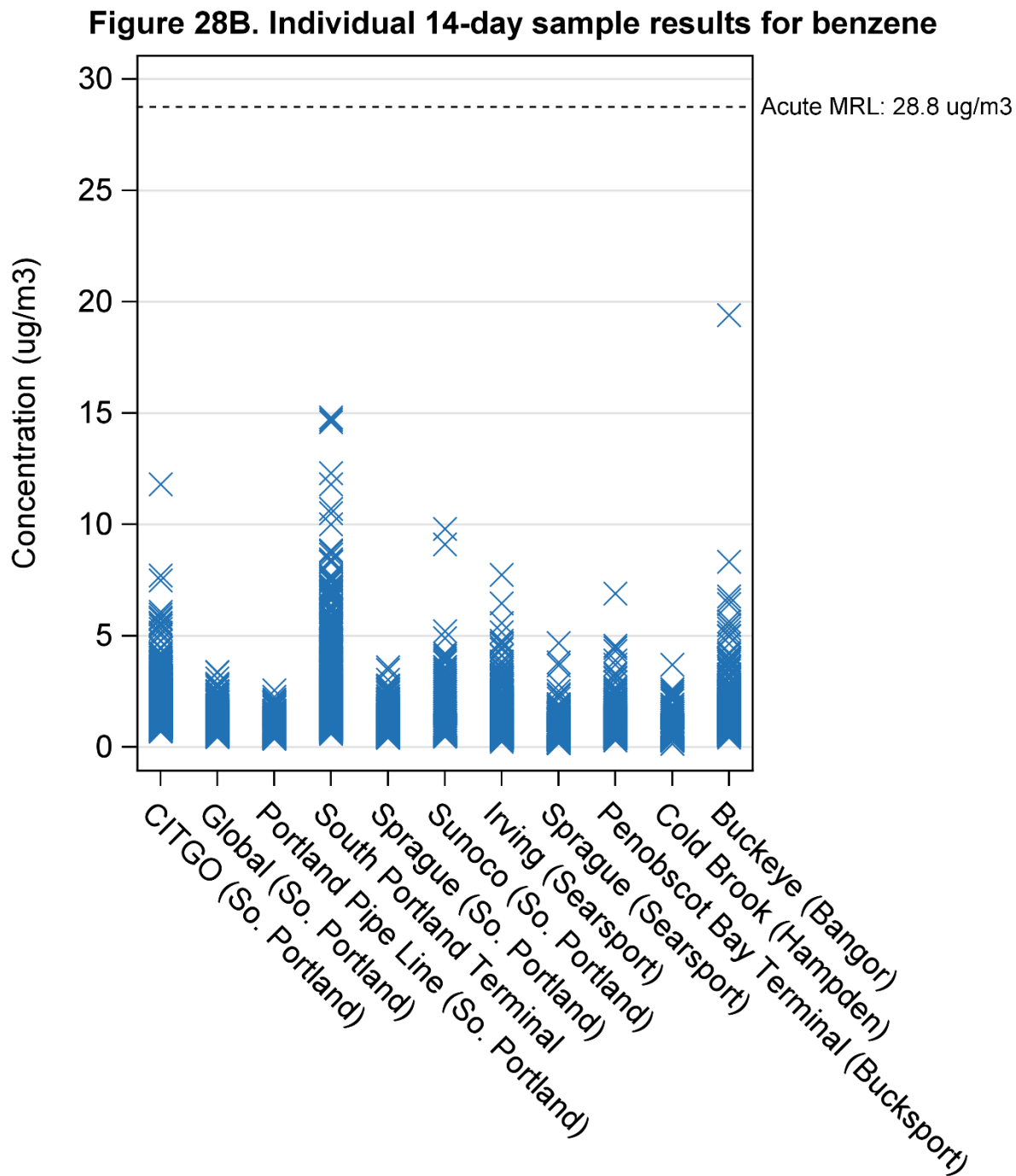


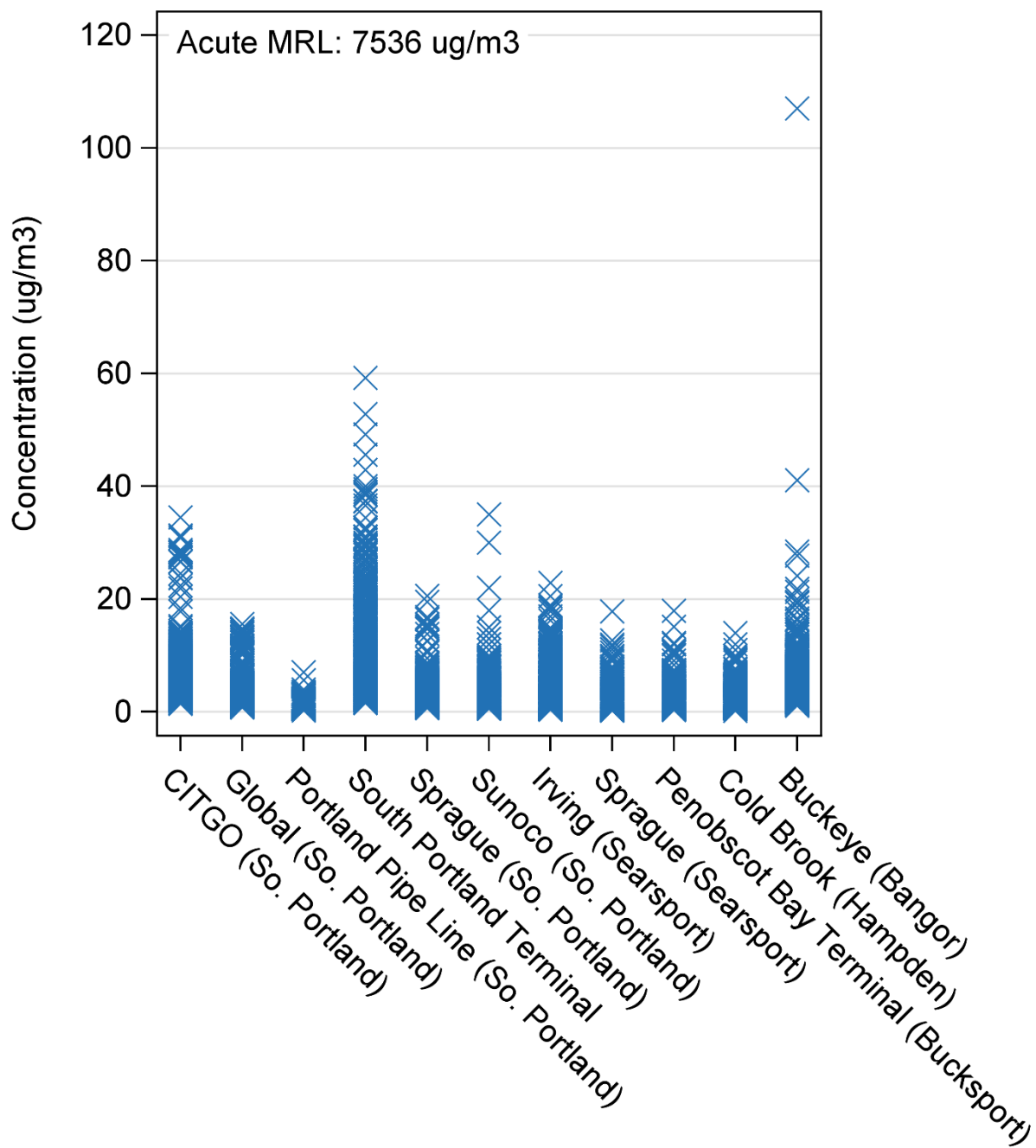
Figure 29B. Individual 14-day sample results for toluene

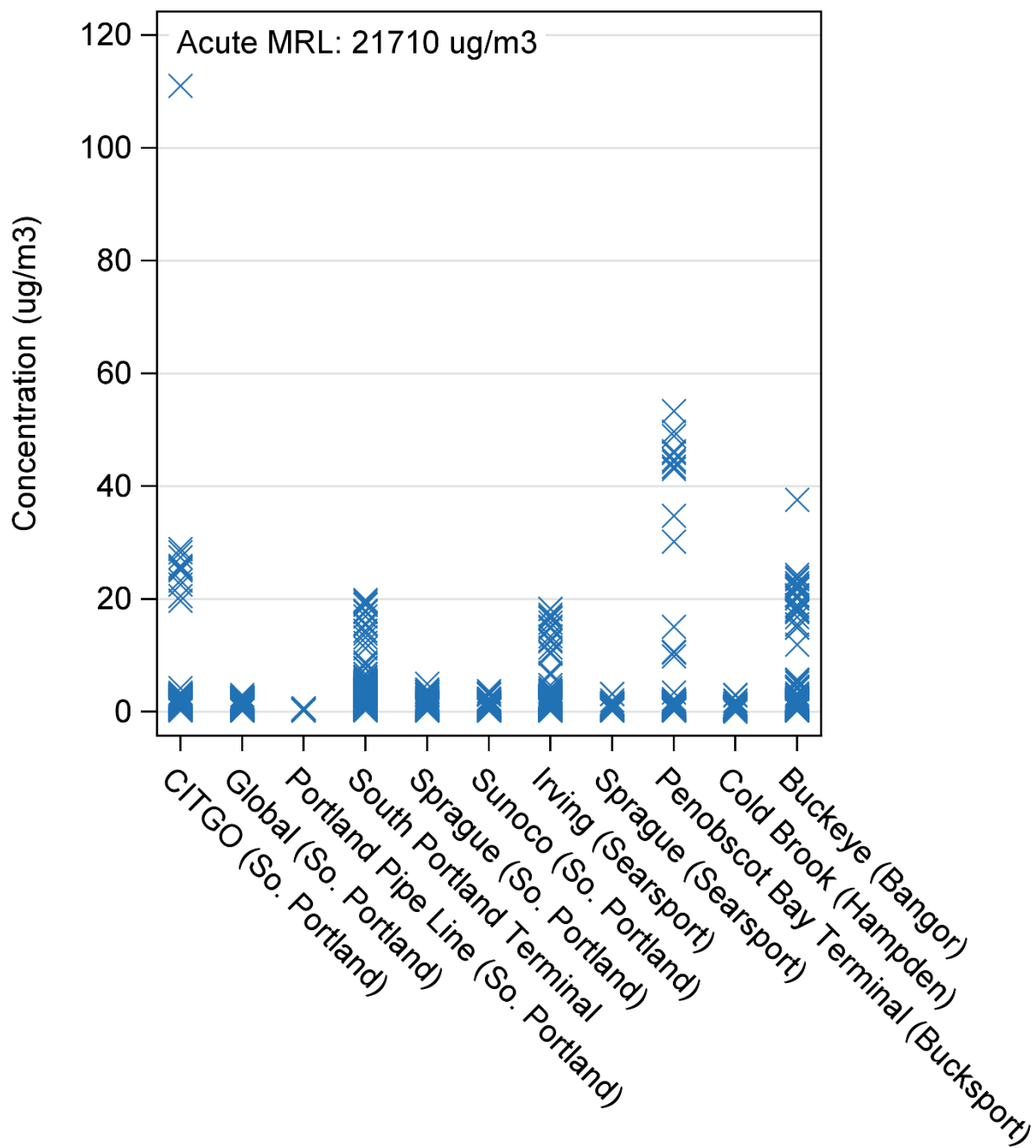
Figure 30B. Individual 14-day sample results for ethylbenzene

Figure 31B. Individual 14-day sample results for xylenes