Division of Water

Annual Summary Report 2024

Ambient Marine Water Quality, Harbors and Shipping Lane Project

Executive Summary

Monitoring of Alaska's high traffic harbors and shipping lanes provides information about ambient conditions to inform permitting, and to determine if waters meet Alaska Water Quality Standards (WQS). The Department of Environmental Conservation (DEC) began limited sampling in 2015 and in 2020 the program was transferred to the Water Quality group. Presented here is a summary of water quality data collected from 2020 to 2024 by the Ambient Marine Water Quality, Harbors and Shipping Lane Project.

Based on assessed data, marine waterbodies are attaining water quality standards, except for bacteria excursions observed in the Tongass Narrows, near Ketchikan. Assessment of these waterbodies are included in the Integrated Water Quality Monitoring and Assessment Report.

Introduction and Background

To better understand potential cruise ship effects on marine water quality, DEC monitors ambient conditions (or natural background conditions) in and around Alaska's high traffic harbors and shipping lanes used by cruise ships. This information contributes to two program goals:

- monitoring of state waters for attainment of the Alaska Water Quality Standards (18 AAC 70[1]), and
- evaluating potential impacts from cruise ships to marine waters.

From 2015-2019 monitoring efforts focused on collecting detailed information in the Skagway, Juneau, Sitka, Hoonah, and Seward harbors. In 2020 the program expanded sampling to 18 harbors and the busiest shipping lanes used by cruise ships, for a total of 150 sample sites per year (Figure 1). Sites were sampled annually for metals (total and dissolved copper, nickel, zinc), ammonia as nitrogen, and select sites were sampled five times annually for bacteria (fecal coliform and *Enterococci*). These are the pollutants regulated in cruise ship permits and were chosen to ensure appropriate limits were developed and that those limits are protective of the environment.

In 2020 and 2021 due to the COVID-19 pandemic there were no large cruise ships operating in Alaskan waters. This provided an opportunity to sample without the presence of large cruise ships. A comparison of the data shows no statistical increases of sampled pollutants due to the

[1] Alaska Water Quality Standards, 18 AAC 70 (2025). More information is available at http://dec.alaska.gov/water/water-quality/standards/

presence of cruise ships, except ammonia as nitrogen. A small increase in ammonia as nitrogen was observed, although levels remained well below water quality criteria.

DEC employs two sampling strategies in the Ambient Marine Water Quality, Harbors and Shipping Lane Project, screening and assessment. Screening data is only collected once or twice a year and allows DEC to monitor areas that routinely achieve WQS and identify areas that need more investigation. Screening level data continues to be collected at all ports receiving more than 10 cruise ship visits and for all shipping lane sites. Assessment data is collected more often and at more locations. DEC collected assessment level data during 2023 and 2024 for Ketchikan/Ward Cove, Juneau/Auke Bay, and Seward for metals and bacteria. In Valdez, Skagway, Whittier, and Hoonah assessment level data was only collected for bacteria. See Figure 1 for sites sampled in 2024.

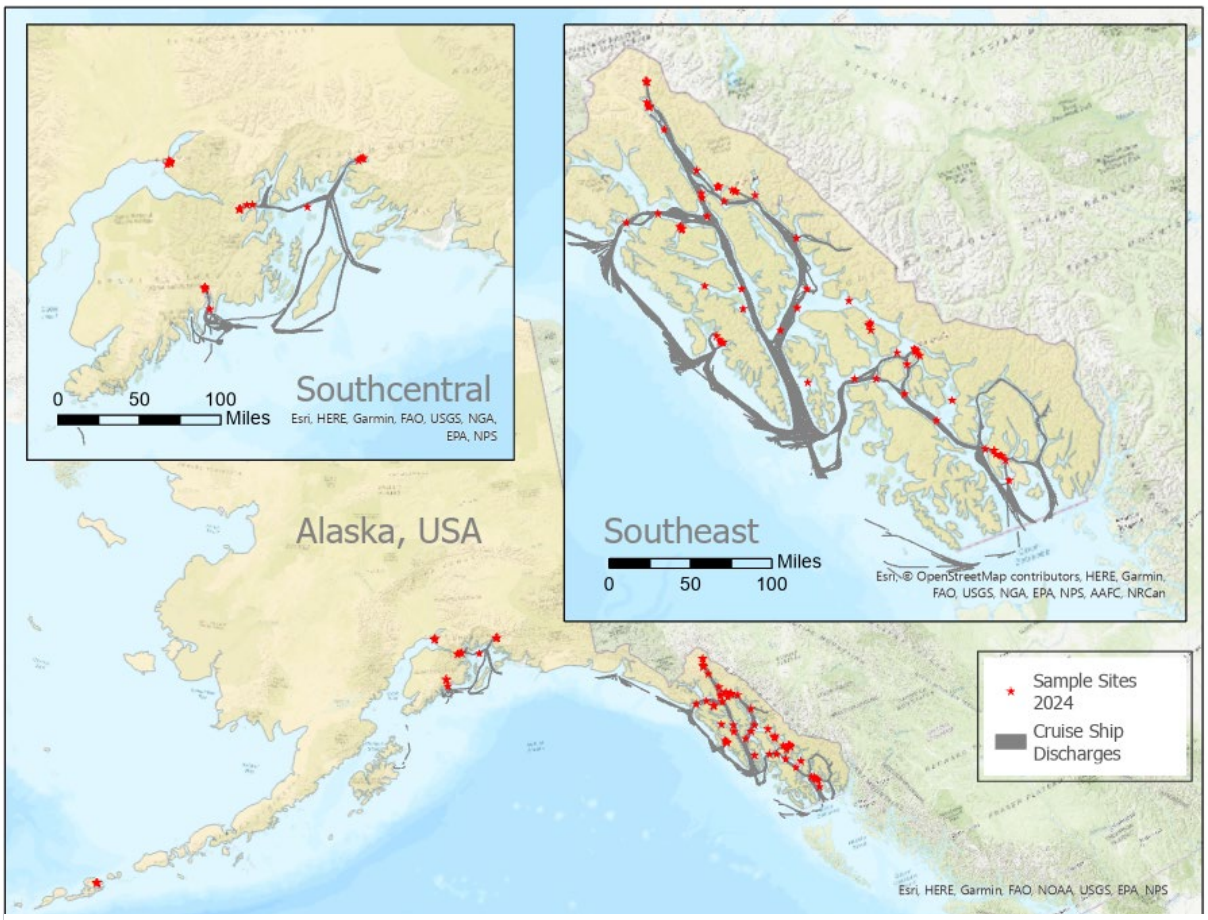

Figure 1. Sites sampled during the 2024 summer season shown with 2022 Cruise Ship discharges.

WQS are assessed based on a geographic area called an Assessment Unit (AU) that delineates a waterbody. Data from each AU are pooled and compared against WQS for each pollutant. Data collected in 2024 encompasses 58 assessment units, 14 of which are characterized with assessment level data. More information about the program can be found at the DEC marine monitoring website. This website includes a link to the raw data, a map-based data dashboard to explore and visualize the data, and PDF reports. Presented here are selected summaries for the 2024 season compared with the averages from past years.

Data Summaries

In 2024 we began resampling at the most established monitoring locations to allow tracking of changes over time. This program continued to assess marine waterbodies for the attainment of WQS, with a rotating focus on harbors that receive 10 or more cruise ships per year, in addition to providing annual screening level data at all sample sites. Figures 2 – 7 present monitoring results from the 2024 season alongside data from 2020-2023, which has been averaged together. In all graphs the most stringent water quality criteria are represented by the grey bar. The elevated levels of metals near Anchorage are believed to be from natural sources.

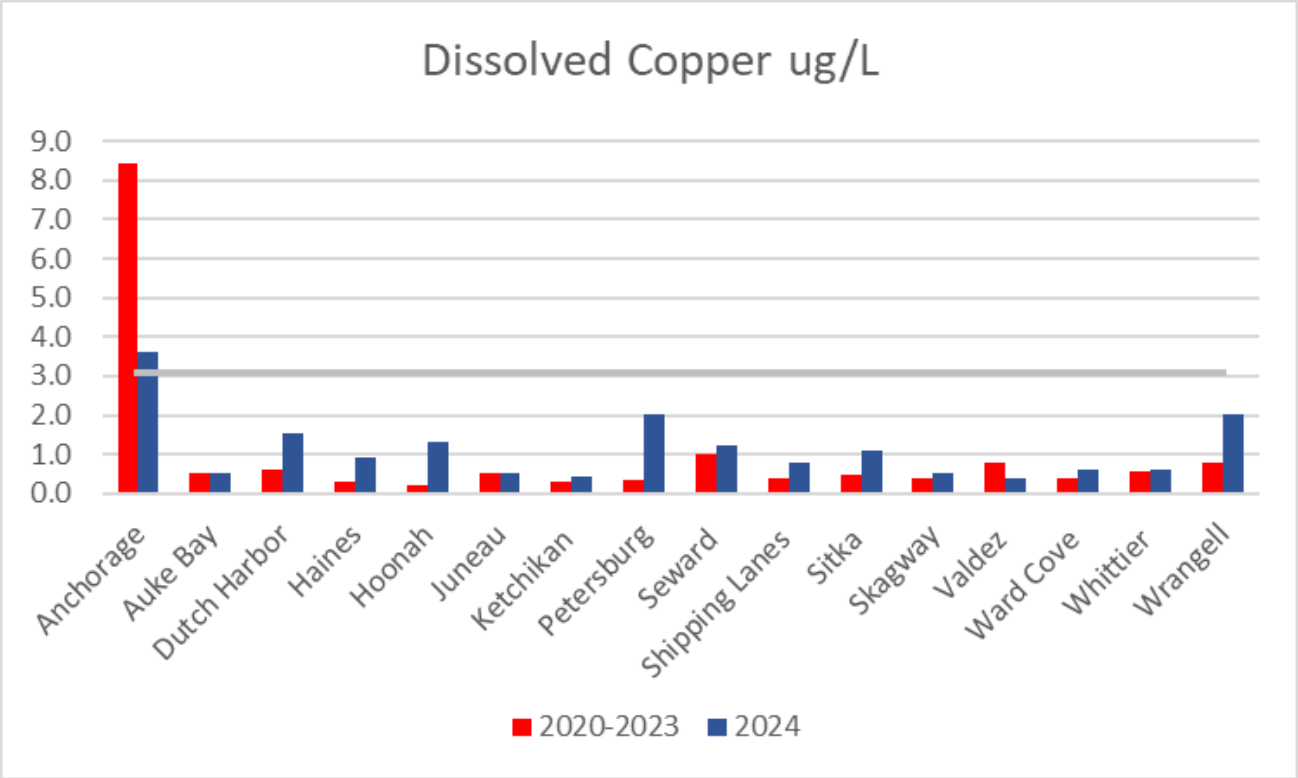

Figure 2. Sample results averaged for 2020-2023 and 2024 for dissolved copper and the water quality criteria (grey bar) of 3.1 micrograms per liter.

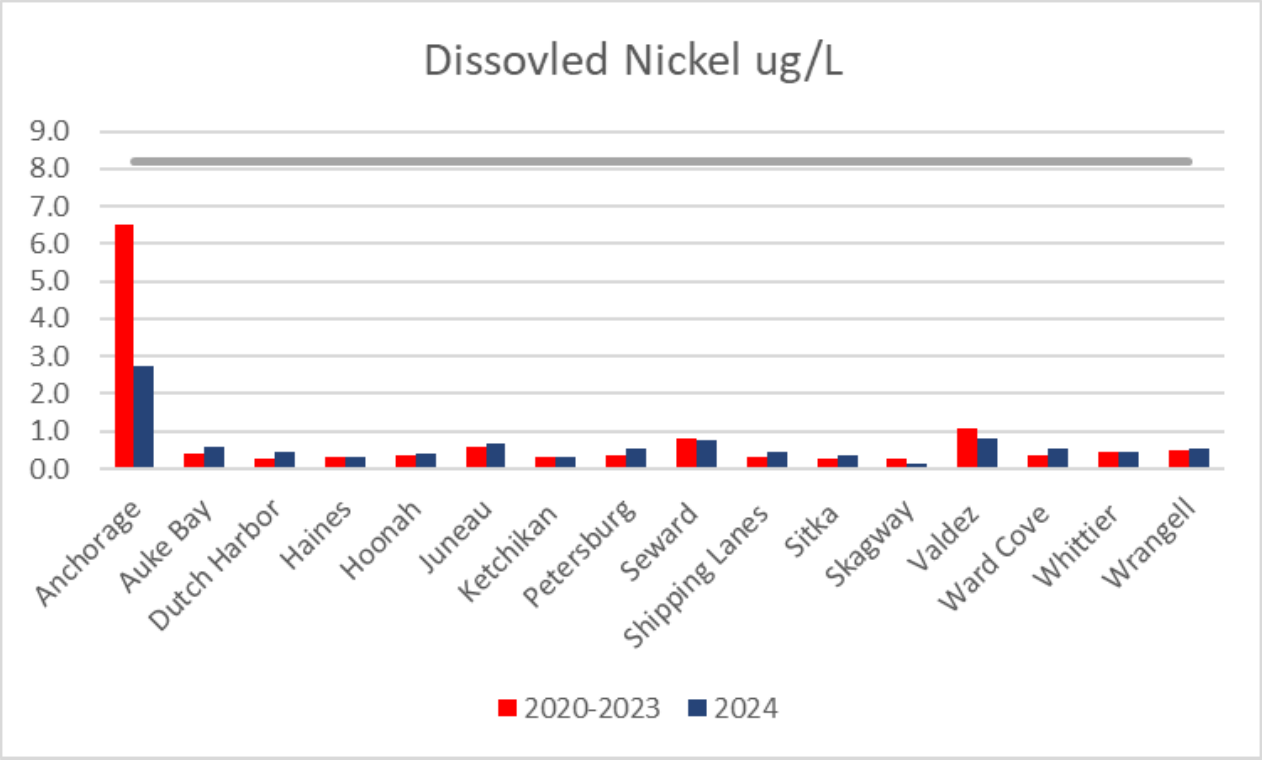

Figure 3. Sample results for averaged for 2020-2023 and 2024 for dissolved nickel and the water quality criteria (grey bar) of 8.2 micrograms per liter.

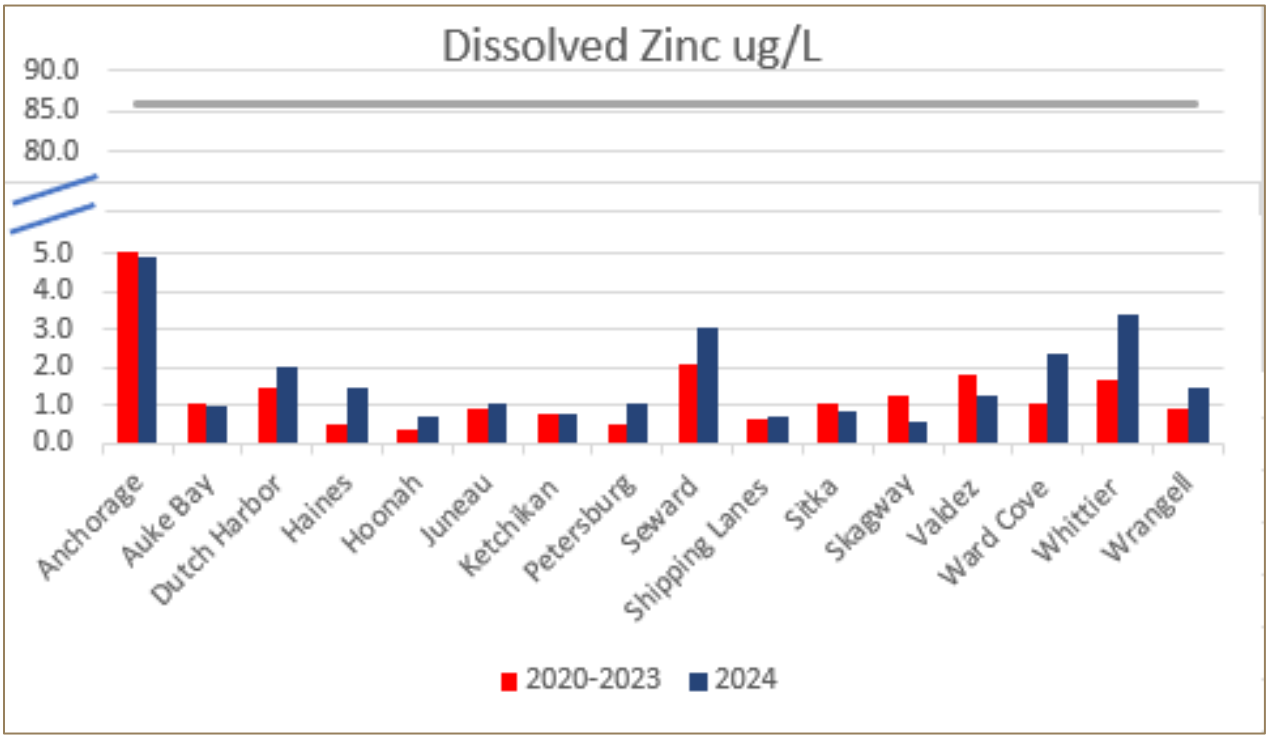

Figure 4. Sample results averaged for 2020-2023 and 2024 for dissolved zinc and the water quality criteria (grey bar) of 86 micrograms per liter.

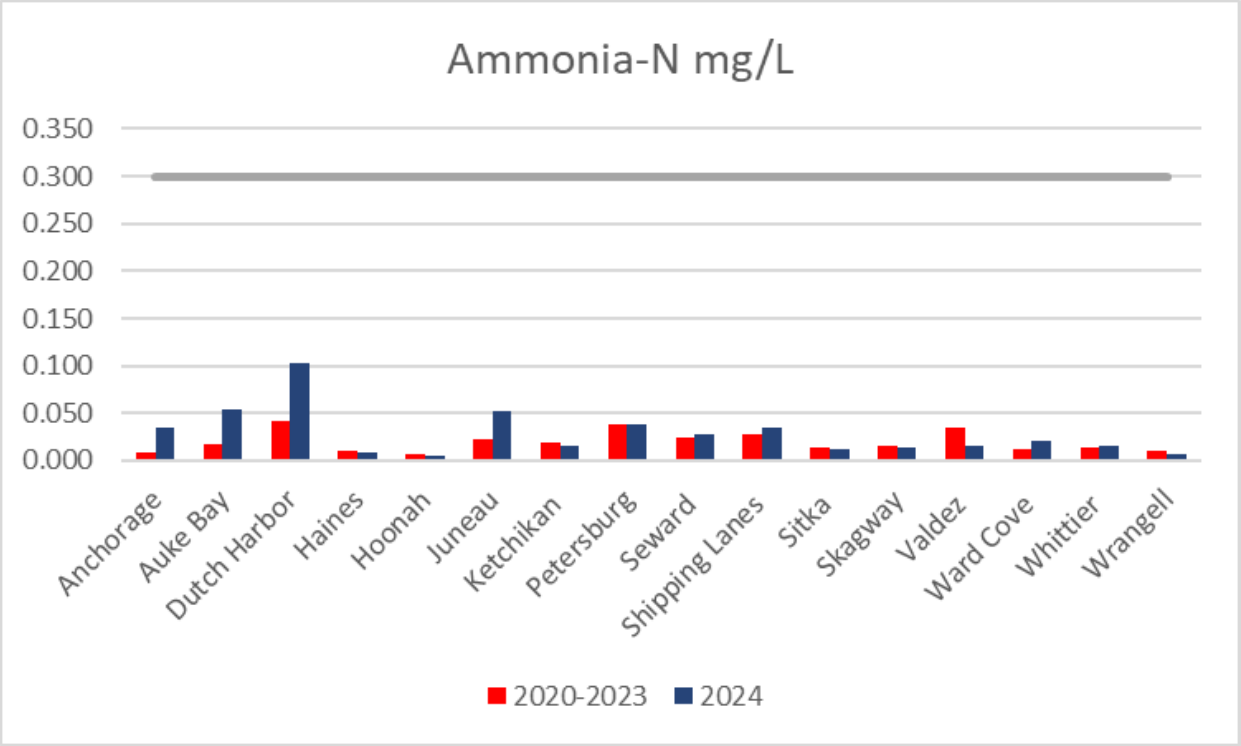

Figure 5. Sample results averaged for 2020-2023 and 2024 for ammonia as nitrogen and the water quality criteria (grey bar) of .3 milligrams per liter.

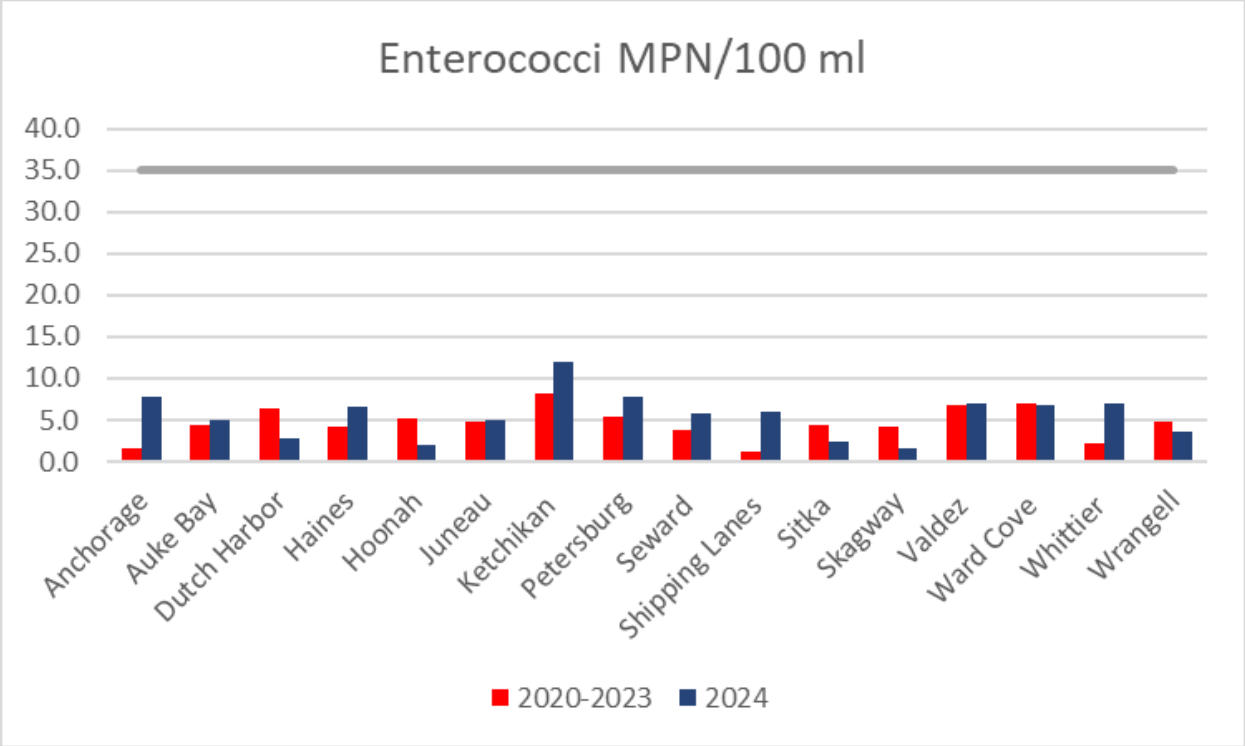

Figure 6. The annual geometric means averaged for 2020-2023, and the geometric mean for 2024 for Enterococci and the water quality criteria (grey bar) of 35 Most Probable Number per 100mL.

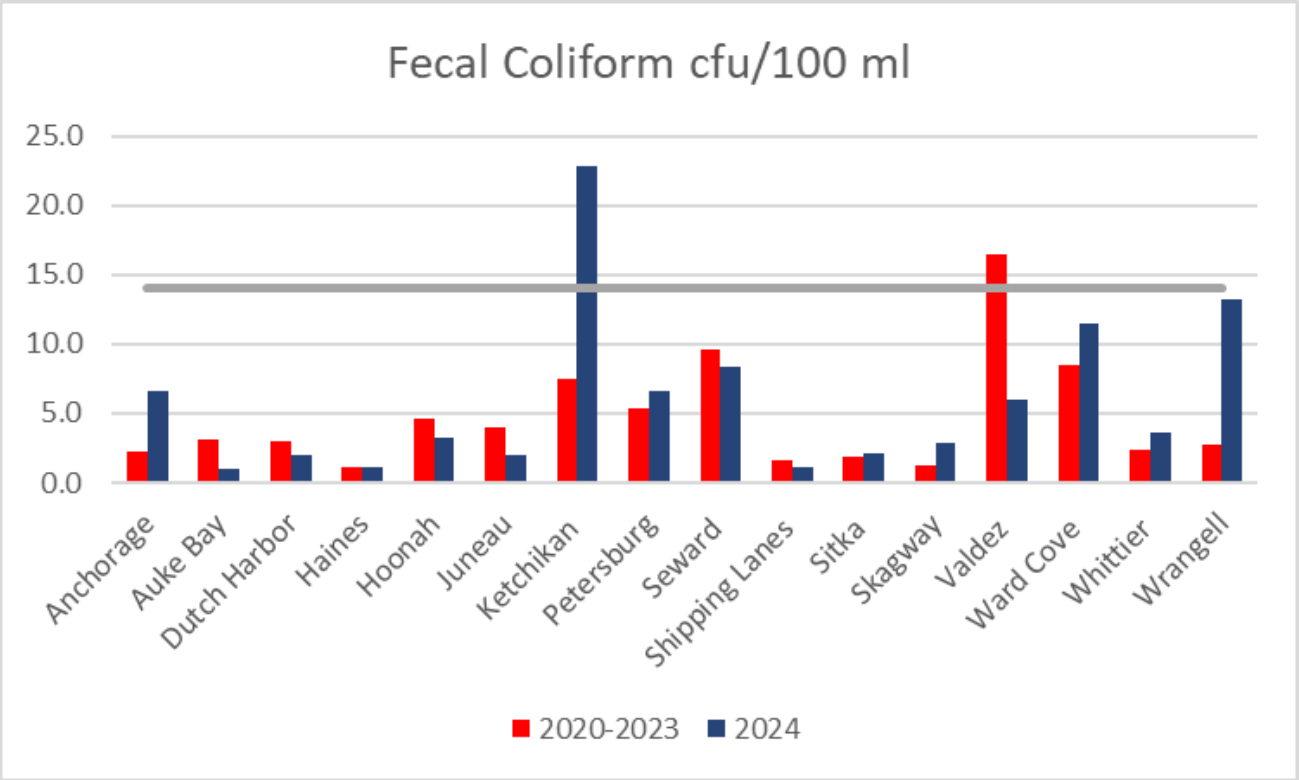

Figure 7. The annual geometric means averaged for 2020-2023, and the geometric mean for 2024 for Fecal Coliform and the water quality criteria (grey bar) of 14 colony forming units per 100mL.

Microbial Source Tracking

Microbial Source Tracking detects unique microbes found in digestive tracks of mammals which can be used to identify bacteria sources. This sampling was done near Valdez and Ketchikan due to elevated pathogens in past results. Results from the Tongass Narrows indicate human sources, and results from Valdez indicate human and bird sources.

Continuous Water Quality Measurements

Three water quality monitoring instruments equipped to record and upload data remotely were successfully deployed in Ketchikan, Juneau and Seward. These locations match where data is being collected for assessment (Figure 8). Instruments logged pH, temperature, salinity, dissolved oxygen, and turbidity every 30 minutes, enabling near real-time monitoring. This helps us build a better understanding of natural fluctuations, providing greater context for sampling occurring at these locations. For example, when turbidity is high, we can expect elevated levels of pathogens due to increased stormwater run-off. If we get a sample result with elevated pathogens at a time when turbidity is low, it may be more likely due to offshore discharges. Data were transmitted to an online dashboard (Figures 8 and 9) using a platform called HydroVu. This effort was made possible through partnerships with the Ketchikan Indian Community, the City of Ketchikan, the City of Seward, the City and Borough of Juneau.

Figure 8. A schematic of water quality sensors equipped with HydroVu (left), sensor installation (middle in Juneau, right in Ketchikan).

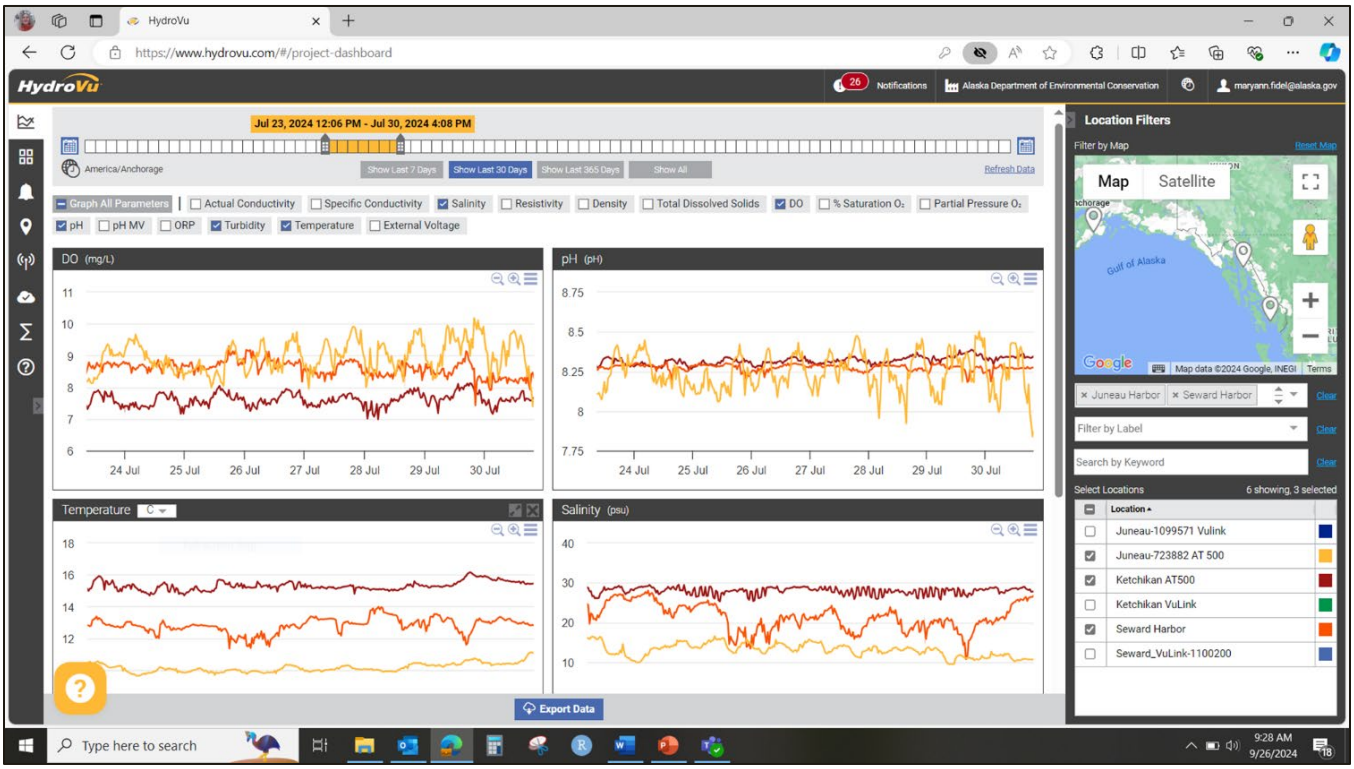

Figure 9. Example of one week of continuous water quality measurements collected from the Juneau, Ketchikan and Seward harbors, as displayed in the HydroVu data dashboard.

Conclusion

With an estimated 1.65 million cruise ship passengers in 2024 and expected increases in the future, it is important that DEC continues to monitor marine water quality to ensure cruise ship permits are protective of the environment and human health.

In 2025 we plan to work with a contractor to compile this and other marine water quality data and complete an in-depth analysis with recommendations to guide future monitoring efforts. We will continue water quality sampling and to deploy continuous water quality sensors. It is difficult to assess large marine water bodies with certainty due to their size, and the volume of water moving through these systems, as such uses of these data do have limitations. We are using established tools found in the DEC Alaska Consolidated Assessment and Listing Methodology[2] to conduct a data-driven assessment of waterbodies recognizing the data limitations. Based on assessed data, analyses indicates that water quality standards are being met, with the exception of exceedances for fecal coliform in the Tongass Narrows. Additional data for pathogen assessment will be collected in Tongass Narrows in spring 2025. Assessment results are reported through the Alaska Integrated Water Quality Monitoring and Assessment Report, and on our webpage at https://dec.alaska.gov/water/water-quality/monitoring-and-assessment/watershed-health-and-data-analysis/ambient-marine-water-quality-monitoring.

[2] Alaska Consolidated Assessment and Listing Methodology. DEC. 2021 https://dec.alaska.gov/water/water-quality/integrated-report/