

YSI 6200 Technology Used to Protect Pamlico Sound



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YSI Continuous Monitoring System
Application Note A500-02

ADVANCED WATER QUALITY ASSESSMENT PROGRAM University of North Carolina and Duke University Marine Lab

The Pamlico Sound extends north from Core Sound to Albemarle Sound along the North Carolina coast. It is among North Carolina's most important natural and economic resources, processes nearly half the freshwater runoff from North Carolina, and provides critical foraging and nursery habitats for fish populations along the mid-Atlantic and southeastern US coasts. It is the nation's largest lagoonal estuary and yet there is little knowledge of its physicochemical and biological characteristics.

The principal sources of freshwater to the Sound, the Neuse, the Tar-Pamlico and the Chowan rivers, are severely stressed by anthropogenic nutrient loading. The consequent perturbation has resulted in the decline of its fishery which has been documented for two decades and is coincident with accelerated land use changes in tributary watersheds and increased nutrient loading.

Considering the dire need for physicochemical and biological data, and the need to amass this data at rates far exceeding those afforded by conventional methods, two biological oceanographers, Joe Ramus, and Hans Paerl, decided to manifest an idea that they had been developing for several years. This was to utilize North Carolina Department of Transportation (NC-DOT), Ferry Division's vessels, that traverse Pamlico Sound many times each day, as "ships of opportunity" and the bearers of automated, continuous water quality monitoring stations.

In many cases the Ferry System might be taken for granted, yet, "...it is the lifeline of the Outer Banks," said Ramus, "It is always on time, operating in virtually any weather condition, crosses the sound along several routes many times each day, and delivers scores of passengers and cargo safely to their destinations every day." Furthermore, NC-DOT maintains these vessels impeccably.

It is for these reasons that Ramus and Paerl considered NC-DOT's ferries the ideal "ships of opportunity" for their



Pamlico Sound: The nation's largest lagoonal estuary and second in size only to the Chesapeake Bay.



A Hatteras-Ocracoke Ferry. Image credit: Outerbanks.com.

monitoring program. Of the seven routes traveled many times each day, three were of principal interest to begin the program.

Having determined the routes necessary to begin the program, Ramus and Paerl began the search for a water quality monitoring system that would meet their application and withstand the rigors of continuous, shipboard monitoring. After a lengthy investigation, Ramus contacted YSI Integrated Systems & Services to learn more about their Data Acquisition System. Ramus said, "I knew that we had made the right decision after speaking with them... I could tell that I was talking with a company that was very knowledgeable and had the experience that we needed."
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Ramus was drawn to YSI by their success in continuous, real-time monitoring of wastewater processes and effluents with high bio-fouling conditions. "In many ways estuaries aren't much different than wastewater treatment plants as far as the conditions in which you have to work... I could find systems that would work fine in blue ocean water, but not in estuaries," Ramus said.

The YSI System provides data storage and management, communication interfaces, and automated control and event response features. Ramus and Paerl, along with YSI Systems application engineers, designed a water quality monitoring system for mounting in the NC-DOT ferries. "I shopped around the world for the [water quality] monitoring system that would best suit our application. YSI's reputation is superior, and the YSI system came up on top hands down," said Ramus.

Ramus and Paerl, along with the skillful assistance of Tim Boyton, outfitted three ferry vessels with YSI-based water quality monitoring systems equipped to measure DO, temperature, pH, conductivity, salinity, turbidity and chlorophyll. The system stores water quality data from the YSI sondes and transmits this data via cell phone-to-land line communication link to UNC-IMS lab, once each day, where it is inspected by the program's data manager prior to further processing and posting. Alltel, a partner in the program, provides wireless communication service at a greatly reduced rate.

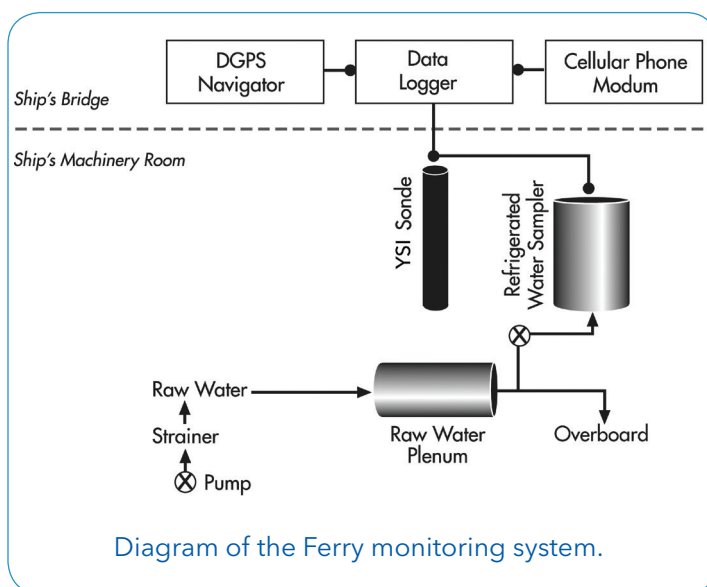
In addition, each on-board YSI-based water quality monitoring system is equipped with a refrigerated automatic sampler. The samplers are used to take instantaneous physical samples that are later analyzed at the UNC-IMC's lab for colored dissolved organic matter (i.e., tannins and lignins), as well as for nutrients such as silicon, and forms of nitrogen and phosphorus.

When asked how the monitoring systems have been performing, Ramus reported, "it is field-hardened, reliable,

and holds calibration. And YSI's technical support both on-line and on-site has been excellent."

Ramus, Paerl and company have received tremendous support and cooperation from the Ferry System, and in particular Jerry Gaskill, Dan Noe and their team of engineers. Ramus reports, "It's not just a good environment in which to set up continuous monitoring stations, it's a nurturing one... they have as much interest in the system as we do."

The ultimate goal is to equip all seven ferries with YSI systems and provide the data necessary to develop water quality models for the entire Sound. Ramus explained, "this program is a national model, if not a model for the world. Ferries traverse coastal systems countless times each day throughout the world and can provide an invaluable ancillary service as "ships of opportunity" for the acquisition of water quality data, for the restoration and protection of the world's coastal waters."



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