

# Use of technology for safer marine navigation

THE WATERWAYS & SHIPPING ADMINISTRATION (WSV) IS TAKING THE LEAD IN USE OF ADVANCED TECHNOLOGY

*Summary:* In 2009 Aanderaa Data Instruments together with its German distributor, Nautilus Marine Service GmbH (NMS), were awarded a contract by the German Waterway and Shipping Administration (WSV) to modernize their network of hydrological monitoring stations along the German coast with products and services provided by Aanderaa. The upgrade comprised 7 data buoys and 10 river pile stations along the estuary of the River Elbe as well as the delivery of up to 180 SEAGUARD®s for different waterways and shipping offices along the Baltic Sea, the North Sea and the estuaries of the Rivers Weser and Ems.

Today the Waterways and Shipping Administration in Germany is taking the lead in use of technology for safer Marine Navigation. The Elbe river monitoring system consists of several building blocks where some of them are standard products from Aanderaa like the SEAGUARD® Current Meter with optional sensors for monitoring water flow (speed and direction), turbidity, salinity, temperature and dissolved oxygen, as well as real-time data communication.

In view of the modernization of the hydrological measurement stations along the river Elbe the combination of Aanderaa products and services and the expertise of NMS for the design and installation of river moorings were a perfect match.

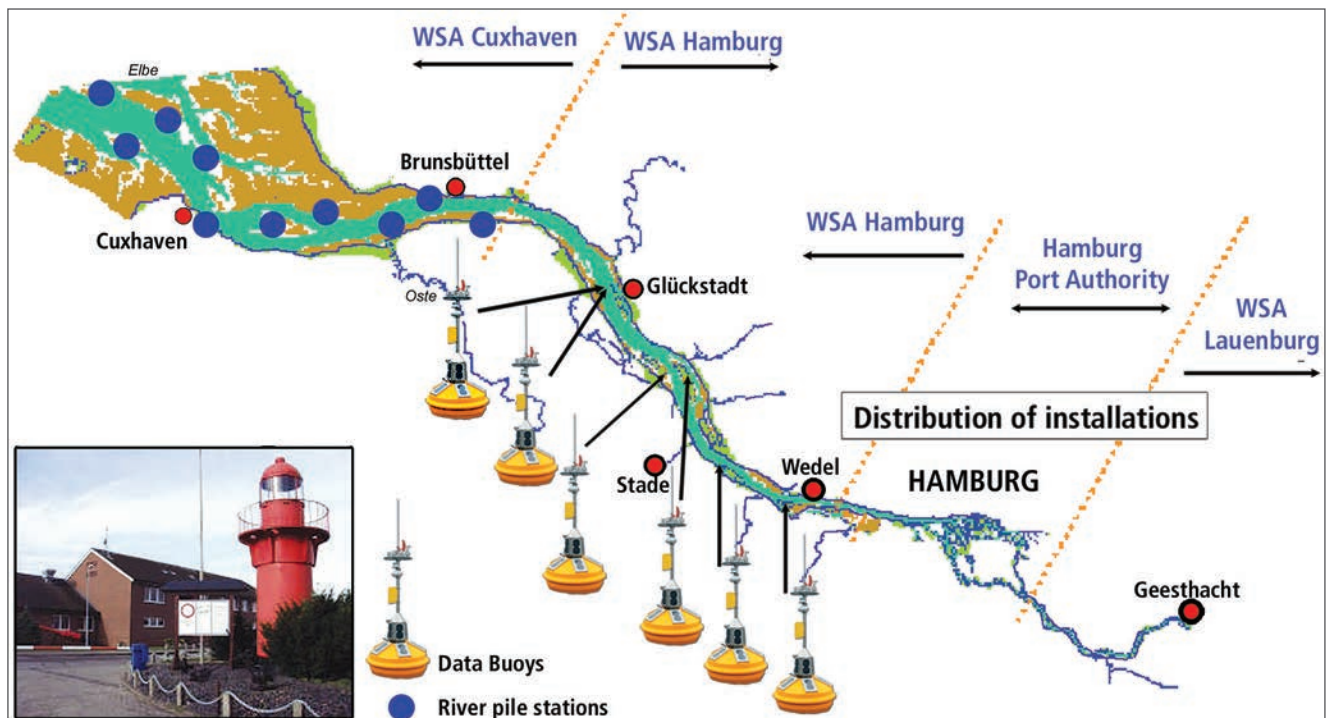
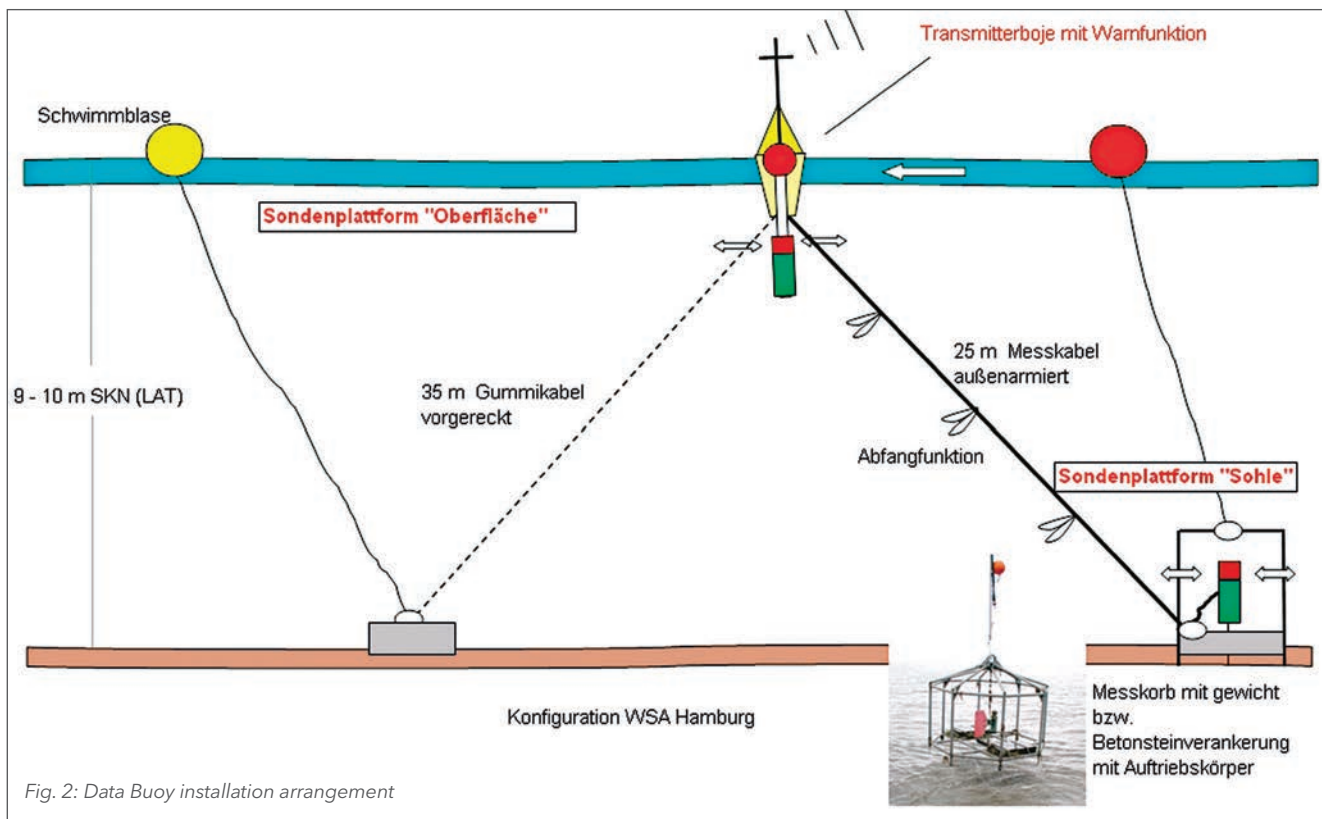


Fig. 1: The SEAGUARD® Monitoring Stations and Data Buoys positions in River Elbe

# The Waterways and Shipping Administration



WSV, is the regulating authority of all significant federal navigable waters including rivers, canals, locks and seaward approaches within the sovereign territory of the Federal Republic of Germany, and is organized in 3 administrative levels:

- Ministry of Transport having the supreme authority
- 7 Waterways and Shipping Directorates (WSD)
- 39 Waterways and Shipping Offices (WSA)

The two Waterways and Shipping Offices (WSA) Hamburg and Cuxhaven are predominantly competent and responsible for the accomplishment of the principal duties within its administrative district such as:

- Administration of the federal waterways Elbe as well as adjacent territorial waters
- Providing the safety of navigation by:
  - Maintenance of a deep shipping channel in the River Elbe, including sounding and dredging, buoys and lighthouses, operation of Vessel Traffic Centre (VTS), pilots, Navigation Permits Notices to Mariners, shipping police functions and more
- Grant of permissions for installations and constructions, marine surveys, construction and maintenance of installations and operation of a buoy yard with all necessary work and repair as well as berths for the WSA fleet



# Why choose Aanderaa Data Instruments



Fig. 3: Data Buoy installation and deployment arrangements.

Aanderaa Data Instruments received the contract under strong competition and after a quite long procurement period that started with a qualification process almost one year ahead of the public invitation to tender. Notwithstanding the best commercial offer that was placed by NMS, another important factor for success was the excellent cooperation between NMS and Aanderaa during the procurement phase.

In view of the modernization of the hydrological measurement stations along the River Elbe the combination of Aanderaa products and services and the expertise of NMS for the design and installation of river moorings were a perfect match.

The Data Buoys provided by Aanderaa were fitted with a SEAGUARD® RCM including a series of sensors just below the buoy in order to monitor water flow (speed, direction), temperature, pressure, salinity, turbidity and oxygen. A second, identical configured SEAGUARD® RCM was installed at approximately one meter above the riverbed in a bottom frame and linked with the data buoy by a special data and lifting cable. Data from both SEAGUARD®s was stored and transmitted in real-time from the buoy into the network of the WSV. The sensor setup for the pile based stations was similar. Here the same parameters as for the buoys were measured approximately 2 and 4 meters above the riverbed and sent out in real-time.

Acquisition of hydrological standard parameters along the River Elbe was necessary to fulfil WSV's duties in terms of administration and the provision of safety for the federal waterway Elbe and adjacent territorial waters.

Observed rising dredging amounts at the Elbe estuary over the last years due to greatly increased dredging activities of the Hamburg Port Authority, as well as an upstream shift of dredging

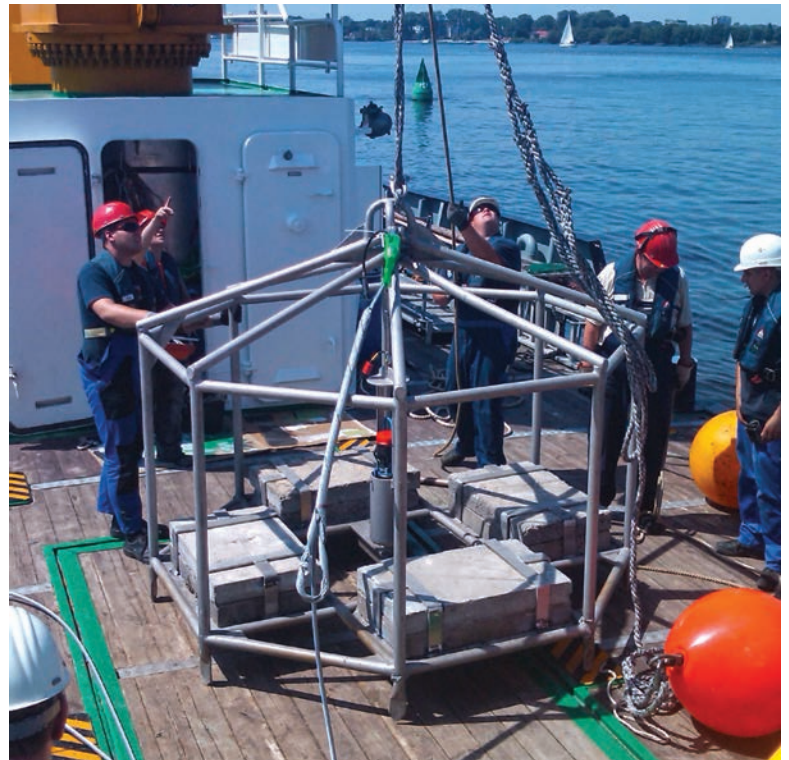


Fig. 4: SEAGUARD® installation and deployment arrangements.

areas of the WSV towards Hamburg during the same time period, requires more dredging capacities and subsequently more ecological tests to be carried out. This to give real-time input to live data models predicting the transport of sediments into the shipping channels. In this regard it is very important for the WSV to rely on exact measurements for turbidity. Aanderaa has put a lot of effort into the calibration process of turbidity sensors in order to supply accurate and reliable instruments.

All turbidity sensors can be interchanged; measurements are comparable and are of course within the required specifications.

Hence, these technical advantages within our elaborate concept, the well-known reputation of delivering high-quality products and the ability to adapt to customer needs and build a monitoring system that could measure in real-time was an important key factor for Aanderaa Data Instruments when winning this contract.



## Challenges during the implementation

One of the main challenges was to find a cost efficient way to transfer data from the riverbed to the surface buoy. High currents and tide made it difficult to use a conventional single mooring solution. Our approach was to design a two point mooring with a cable wired for power and communication working as one of the mooring points. A rubber cord was chosen as the other mooring point keeping the communication cable stretched at all times independent of the tide level in the river. Lifting eyes were mounted on the real-time cable for emergency retrieval of the system. Breaking strength of cable was specified to 5 tons. A special mooring frame was designed for our standard data buoy. In addition to enable the use of two point mooring the frame was designed to make deployment and retrieval of the buoy as efficient as possible.

Another requirement was time synchronization of all instruments in the system. The time synchronization should enable the instruments to start logging at the exact same time. This

again made it possible to better correlate data from all measuring stations along the river. To accomplish time synchronization and data transmission of data from multiple instruments through one communication channel we needed to develop a new communication device. This communication device should act as a hub for different instruments. The main task would be to record and forward data from multiple instruments to the riverbank and secondly to talk to a GPS receiver and send time corrections to the instruments.

At each receiving station along the river we installed radio receivers and a communication hub. Special software installed on the communication hub filtered and formatted data in order to be compliant

with the existing data network. Incoming data was forwarded to the customers modem and then automatically stored in their data-base.

The number of self-recording instruments in this project far exceeds the number of instruments with real-time data. The data from these instruments are collected on SD cards and can normally only be viewed in Aanderaa SEAGUARD® Studio Software. A special data export function was developed in order to export data into the same data-base as the real-time data.

This was a great opportunity as a project for us to apply our combined resources and technology, and we are continuously working to utilize this project as a standard solution for all VTS, coastal and waterway projects.

**Technical advantages within our elaborate concept, delivering high-quality products, ability to adapt to customer needs and building a monitoring system that could measure in real-time were important key factors for us when winning this contract.**

Reference contact in Wasser- und Schifffahrtsamt Hamburg (WSV)  
Dr.-Ing. Ingo Entelmann, Email: [ingo.entelmann@wsv.bund.de](mailto:ingo.entelmann@wsv.bund.de)

[xylem.com](http://xylem.com)