

SOP 2 – Preparation of the Logging Station

Version 1.0 (August, 2007)

The following table lists all changes that have been made to this Standard Operating Procedure since the original publication date. Any recommended or required changes added to the log must be complete and concise and promptly brought to the attention of the Project Leader. The Project Leader will review and incorporate all changes, officially complete the revision history log, and change the date and version number on the title page. For complete instructions, please refer to Instructions for Recording Revisions in SOP 13.

Revision History Log:

New Version #	Previous Version #	Revision Date	Author (full name, title, affiliation)	Location in Document and Description of Change	Reason for Change

Introduction

This SOP describes methods for permitting, installing, and maintaining stations for continuous monitoring of water quality using the YSI 6600EDS multi-parameter sonde. NPS Northeast Region coastal parks are each quite different, and this SOP allows for a variety of approaches to constructing continuous monitoring stations. The exact architecture of the logging stations is flexible to accommodate variation in geographic setting, vulnerability to inadvertent damage or vandalism, and logistical considerations. Consequently, some portions of this SOP provide general guidance while other portions firmly prescribe standard methods necessary to achieve performance standards and data compatibility. This distinction is emphasized where applicable in the SOP.

At each park, one station is established for continuous monitoring throughout each index period. These stations are not part of the RTS design and are selected using best professional judgment. To the extent possible, their positions should be representative of the overall estuary, while also take into account logistical considerations such as ease of access, interference with public use of the resource, and vulnerability to vandalism or incidental damage.

To reduce interference of sun-shadows on measurements of photosynthetically available radiation (PAR), ideal continuous-monitoring stations will be located on structures that are unobstructed to the South. The water depth (at low tide) must be at least 1.25 m at all times in order to accommodate the PAR sensors. This assumes they are packaged to the YSI 6600EDS, but shallower depths (down to 0.85 m) can be accommodated if necessary. This would require separate mounting of the YSI sonde and the PAR sensors so that the sensor array on the sonde stays at least 0.5 m off the bottom, and the upper PAR sensor stays at least 0.25 m below the water surface.

Design and Permitting of Support Structure

The EDS YSI sonde must be mounted on a pier, piling, or other support structure during a 4-week late summer sampling period. Infrastructure requirements vary for each park, and not all parks need new pilings or work platforms for continuous water-quality monitoring. Parks should be surveyed initially for existing structures that could be used to support the monitoring equipment. At GATE, for example, an existing pier provides an ideal mounting structure, and ASIS already has established monitoring platforms. For other parks, temporary pilings that are installed and removed seasonally may be preferable to permanent structures. For example, Great South Bay freezes over many winters, and ice damage to pilings can be severe. Rather than design an installation to withstand the ice, it may be preferable for FIIS to simply install a more modest piling each summer and remove it each fall.

When designing or selecting a support structure upon which the YSI 6600EDS will be mounted, it is important to keep the following design features in mind. Because the 6600EDS used for this protocol is modified to measure underwater PAR (using two LiCor radiometers), it is important that the piling, pier or other support structure not shade the instrumentation during any part of the day. At the latitude of NER coastal parks, this is generally achievable by ensuring that the support structure is unobstructed and has no overhang to the south. Examples of structures included in the feasibility test of this protocol include a pier at GATE with good southern exposure (Figure 21a), a single 4x4 wooden piling jettied 2 m into the sand at FIIS (Figure 21b), and a more permanent monitoring platform installed at Colonial National Historical Park following the design of the Virginia-Chesapeake National Estuarine Research Reserve (Figure 21c).

Permitting requirements depend on whether or not the logging platform is a new, permanent structure. Title 33 of the Code of Federal Regulations, Subchapter C, Part 66 describes the regulation of Private Aids to Navigation (PAtoN) by the U.S. Coast Guard. The installations shown above for FIIS and COLO, if permanent PAtoNs, would most likely be considered information or regulatory markers (warning day beacons). Importantly, a distinction is made between those “private aids” that are permanently installed, and those that are considered temporary. “Temporary aids” are those that will be on station six months or less. These aids do not require a PAtoN application, but they do require notification to the Coast Guard by letter, fax, or email, for publication in the Local Notice to Mariners. Another advantage of a temporary aid is a reduced burden of maintenance. The locations of permitted PAtoNs are printed on NOAA navigation charts and carry an expectation that the owner keep them maintained throughout the year.

Only the U.S. Coast Guard and the Department of Defense are exempt from the requirements of CFR Title 33 Part 66. The Waterways Management Branch of the 13th Coast Guard District maintains a website with information and helpful guidance explaining the PAToN approval process <<http://www.uscg.mil/d13/oan/paton.htm>>. For permanent installations, a completed copy of the U.S. Coast Guard Private Aids to Navigation Application Form (CG-2554) must be submitted to the District Commander of the applicable USCG district (Table 16). For GEWA, COLO, and ASIS, this is the Fifth District, and for ACAD, BOHA, CACO, SAHI, FIIS, and GATE, this is the First District. In most cases, the location of the permanent water-quality

monitoring stations will be outside major boat traffic channels; however, fixed structures (such as pilings) present potential hazards to navigation and may require additional review and authorization from the Corps of Engineers, Department of the Army (Code of Federal Regulations; Title 33, Part 66.01-30). This review and authorization would be conducted by the District Engineer of the applicable district. It is recommended that an advance application (CG-2554) be submitted to the USCG District Commander in order to solicit recommendations on the need for Army Corp review and any suggestions for the formal application.



Figure 21. Logging stations for the 2003 feasibility test. (a) at NYPD Pier, Floyd Bennett Field, GATE; (b) temporary 4x4 piling jetted in near Bennett Beach, FIIS; (c) logging platform installed in the style of the VA-Chesapeake NERR at COLO.

Table 16. Contact information for PAToN applications.

District	Mailing Address	Current Point of Contact
First	Commander (Oan) 1st Coast Guard District 408 Atlantic Ave. Boston, MA 02110,	Jack McLaughlin PATON Manager 1st Coast Guard District (Oan) 617-223-8358 voice 617-223-8073 fax paton@d1.uscg.mil
Fifth	Commander (Oan) 5th Coast Guard District 431 Crawford Street Portsmouth, VA. 23704	Albert L. Grimes III Waterways Manager (VA&MD) 5th Coast Guard District (Oan) Waterways Management Branch 757-398-6360 voice 757-398-6334 fax AGrimes@lantd5.uscg.mil

Deployment Tubes and Brackets

When deploying the monitoring sonde in unattended mode, protection from accidental damage, vandalism, debris, fouling, and animals will not only improve the data quality, but it can also reduce the number of site visits required for servicing. Some sort of mounting tube is recommended for all sites in the NER. The standard mounting tube recommended by YSI Inc application engineers is a length of schedule 40 PVC pipe drilled with cross holes and coated with non-ablative marine antifouling paint. Application engineers currently recommend Petit brand Trinidad SR™ and Interlux brand ULTRA™ paints (Figure 22). A pipe cap is affixed to the top of the pipe, and drilled to accept a length of chain and padlock. The entire deployment tube is attached to the piling or support structure using U-bolts or stainless steel hose clamps. If using the latter, be certain that the drive screws are also stainless steel. The recommended configuration for this SOP calls for a customization of the sonde, which is performed by the manufacturer. Added to the sonde housing are two external bracket arms, which support the PAR sensors (Figure 23). These brackets prevent the sonde from being inserted down a standard deployment pipe (Figure 22) without additional modifications.



Figure 22. Example of a mounting pipe for YSI 6600-series sondes. The bottom of the pipe is drilled with 0.75" holes on 2.0" centers. A 0.5" bolt is installed through the bottom as a stop for the sonde. Photo courtesy of Mike Lizotte, YSI, Inc.

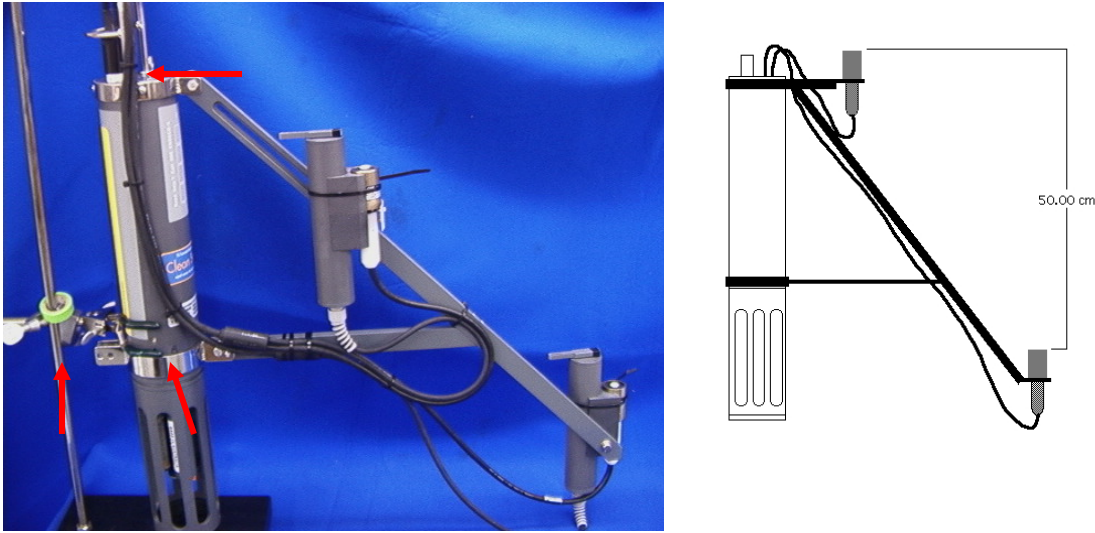


Figure 23. YSI 6600EDS modified with PAR sensors. Brackets hold the sensors 50 cm apart (in depth) and wipers clean the sensors before each reading. Photo courtesy of Michael Lizotte, YSI, Inc. Red arrows (added by the authors), point to ears on the mounting irons (see text for explanation). Note that the wiper motors in this prototype extend above the height of the LiCor PAR sensors. This has since been redesigned to avoid shading of the PAR sensors.

Three approaches are available to resolve the issue of accomodaing PAR brackets.

- 1) Use the general approach recommended by YSI, but cut a slot the length of the pipe to accept the PAR bracket arms.

The preferred solution for this problem is to cut a slot along the length of one side of the pipe to receive the PAR bracket arms. The slot should stop just before the perforations in the end so that the final 8-10" of pipe are fully intact (for mechanical strength). This approach provides the additional advantage of ensuring that the PAR sensors remain properly registered in a southerly orientation throughout the deployment. Note that YSI can supply the LiCor modification with either of two different style attachment irons. One style of iron has ears only on the side where the PAR bracket arms attach (single-eared). The other style has ears both on the bracket arm side and on the opposite site (double-eared). Note that in Figure 23 above, the upper mounting iron is single-eared and the lower is double-eared. When using the slotted pipe mounting approach, both irons must be of the single-eared design.

- 2) Lag-bolt the sonde directly to the piling using the extra ears on the mounting irons.

This approach is very straight forward, but requires that the installer get in (and under) the water. In some cases it may require SCUBA, but only mask and snorkel were needed for installation during feasibility testing at FIIS. The protection from theft provided by this method is about equal to that of option 1 since tools are required to remove the lag-bolts. Disadvantages of this method are that it provides no mechanical protection to the sonde from vandalism or accidental

damage. Boats coming along side the installation may be able to rub up against and damage the sonde, particularly at low tide.

- 3) Use the conventional sonde deployment tube and set up a separate location to mount the PAR sensors.

The YSI sonde is still used to log the PAR data, but longer cables are used to connect the sensors to the sonde. Cables are run up the mounting tube and then down a separate bracket for the PAR sensors. Figure 24 below shows a mounting bracket used for manually wiped PAR sensors (although it is feasible to have YSI provide a custom wiring harness to power the wiper assembly). This approach is only desirable in special circumstances, such as locations that are too deep for acceptable PAR measurements or where it isn't logistically feasible to have the sonde and PAR sensors in the same location (e.g. shading from piers or potential damage from boats).



Figure 24. Separate mounting bracket for PAR sensors. The bracket is constructed of PVC conduit and fabricated to hold two upward looking LiCor PAR sensors 50 cm apart (in depth). The upper arm is shorter than the lower arm to prevent shading of the lower PAR sensor. Note that although the bracket is painted with marine non-ablative antifouling paint (Interlux brand ULTRA™ or Petit brand Trinidad SR™), biofouling is still present on the bracket and PAR sensors after four weeks despite weekly trips to clean the sensor (b).

The support structure should be designed so that the deployment tube can be detached and stored out of the water except when it is needed for sonde deployment (the four-week late summer index period). This will reduce the amount of servicing required to remove biofouling from its inside and outside surfaces. A fresh coat of antifouling paint shall be applied to all underwater surfaces of the deployment tube (inside and outside) prior to each index period. Should

individual parks undertake additional monitoring using these deployment tubes, they should be scrubbed clean, inside and out, with a frequency adequate to keep them free of fouling, and repainted as necessary. Fouling is a particular concern in the lower, perforated portion of the deployment tube where the presence of a fouling community could affect sensor readings. For parks with severe biofouling, this problem can be reduced by omitting the bottom portion of the tube altogether. Instead, the sonde is hung from a chain so that only the sensor guard extends out the bottom of the deployment tube. A lag bolt screwed into the support structure below the deployment tube can still be used as a stop to prevent accidental loss of the instrument should the chain be dropped or the deployment tube damaged.

The deployment tube and stop-bolt must be installed so that the center of the sonde's sensor array will be positioned 0.5 m off the bottom once inserted into the tube. When deploying a sonde, it is lowered down the tube by rope or chain until it reaches the stop-bolt. A cap shall be fashioned for the top of the tube that allows it to be locked against vandalism and theft (Figure 21 a and c).