

Guidelines for the Emergency Recovery of a Current Meter

Procedure Number: SOP #6.3.2.2.5

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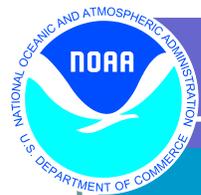
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1. **Title** SOP #6.3.2.2.5 Guidelines for the Emergency Recovery of a Current Meter
2. **Purpose** To guide NOAA or contracted field crews through the process of recovering a current meter that has either released early or failed to release. These guidelines dictate the procedures outlined for both (1) bottom mounted current meters that usually have a pop-up float attached to the submerged base in shallow water, and (2) Submersible Underwater Buoy Systems (SUBS) mounted current meters that have a taught line mooring attached to an expendable anchor.
3. **Background/History** CO-OPS deploys current meters to measure the flow in the coastal oceans and estuaries. These deployments are typically located in the water away from land, and secured to a platform (mount) which is placed on the bottom of the ocean. The mounts contain the current meter and an acoustic release to allow for remote recovery. When the correct acoustic signal is sent to, and received by the release, either a pop-up buoy, a pod with the current meter, or the entire SUBS current meter should surface. These releases periodically experience failures that will cause the release to either trigger early and release the buoy unexpectedly, or fail to release for various reasons. The release failures can be caused by a number of different reasons, with sedimentation and biofouling being the most common. Standard procedures have been in place for years to assist with the various situations. However, every situation is unique, so an understanding of the environment, available resources, and various costs are required by the field personnel executing the emergency recovery.
4. **Scope/Applicability** This SOP should be used as a guide for recovering current meters that either release early or fail to release at all. This SOP cannot cover all possible situations; situational awareness is necessary for each specific case.
5. **Main Processes**
 - A. SUBS Mounted Current Meters
 - a. Early Release
 - b. Failed Release
 - B. Bottom Mounted Current Meters
 - a. Early Release
 - b. Failed Release
6. **Detailed Sub-Processes:**
 - A. SUBS Mounted Current Meters



- a. Early Release - The SUBS buoy will be floating free on the surface and will be equipped with an Argos beacon.
 - i. A Notice to Mariners, submitted soon after the deployment, should have a description and an image, along with contact information for the project's Field Lead.
 - ii. Argos beacons will send out an email with each transmission from the surfaced beacon, attached to the SUBS. Field Leads and Task Managers should be on the associated Argos distribution email list. Not all transmissions will contain a position of the beacon, but most of them will. The transmitted information can be used to plot and track the beacon to assist the recovery effort. Plotting and tracking of latitude and longitude from Argos beacons is covered in SOP #6.1.3.2.1 Guidelines for Recovery Operations of a Prematurely Surfaced SUBS Buoy after ARGOS Transmissions are Received.
 1. Because of the fragile design of the Argos beacon, it can be easily broken, so care must be taken when handling them. If the SUBS comes into contact with any solid and heavy flotsam and/or jetsam, it could snap the antenna, ending the Argos transmissions. In the unlikely event that the beacon breaks before surfacing, there will be no way to track the SUBS other than chance eye witness reports.
 - iii. Try to establish a local contact or field contractor to assist with recovering the mooring. Monetary compensation may be necessary to recover the current meter and SUBS from the person(s) who is in possession of the CO-OPS property. Prior clearance for the compensation should be obtained from the CECAT Team Lead and make the Project Manager aware of the expenditure.
 1. Compensation is paid on a case-by-case basis, but the following guidelines should be referenced:
 - \$500 for an easy, low-effort recovery (e.g., someone finds a mooring in the water and brings it ashore for pickup by NOAA).
 - \$1,000 for a more difficult or arduous recovery, or for an "above and beyond" effort to recover, store and/or deliver the equipment to NOAA.
 - \$1,500 for a requested recovery (e.g., you call a local contact and ask him/her to recover a SUBS mooring and store it for subsequent pickup by NOAA).
 2. All of the SUBS buoys are required to have the toll free (1-800-FOR-NOAA) phone number painted on them. This phone number rings directly to the CO-OPS Chesapeake office. After hours, the answering system is activated; messages are checked each morning.
 - iv. Failed Release - If the correct acoustic signal has been sent to the release, and the SUBS has failed to surface, follow these procedures:
 1. The CART releases (used on most taut-line SUBS moorings) respond back with a confirmation signal, verifying if the release mechanism has triggered. This confirmation assures the release is working

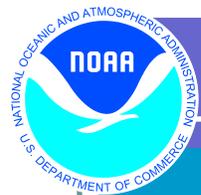


properly and is either open or closed. When enabling the CART release, it notifies whether it is upright or on its side, open or closed. There is also a range function to help triangulate on the mooring's position. For more information on CART release signals and functionality see the SOP or [CART manual](#). Strong pycnoclines can sometimes inhibit the acoustic signal from reaching the release. Repositioning to a deeper and/or more vertical position above the mooring may improve communications, however, with a risk of obstructing the surfacing of the mooring.

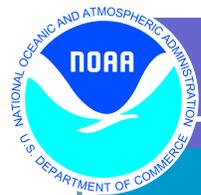
2. Wait: If the release is confirmed as open, it may be a matter of time before a blockage or fouling allows the float to surface. The current (i.e., change in the tide) will sometimes disengage the release mechanism from the CART link.
3. Drag: If the environment and permits allow, attach 2 - 4 grappling hooks to 100+ feet of chain and shackle it to the ship's winch cable. Pay out the chain on the ocean floor in a loop around the mooring. Either use the winch or use the boat to cinch up the loop on the mooring and break it free.
4. Grapple: If the water is shallow enough, using a form of a grappling hook, basically fishing for the mooring by dragging the grappling hooks past the mooring location.
5. Dive: When all other methods fail to recover the SUBS, divers (Contract or NOAA divers) will be required to perform a dive at the location of the current meter. Divers are the most expensive and time consuming option, so all other options should be exhausted first. Again, inquire about the finances available for a dive. A team of divers are usually required and OSHA safety precautions must be adhered to in order to legally proceed with a dive operation. This SOP does not delineate the safety precautions necessary to properly dive for the recovery of a current meter. Each dive team may have different criteria for conducting a safe and successful dive, but ALL must adhere to OSHA and [NOAA Dive Office](#) requirements. Placing a weighted line with a buoy at the known or suspected position of the mooring will help the diver find the mooring.

B. Bottom Mounted Current Meters

- a. Early Release - The float or pod of the bottom mount will be floating on the surface.
 - i. A Notice to Mariners, submitted soon after the deployment, should have a description and an image, along with contact information for the Field Lead.
 - ii. All of the SUBS buoys are required to have the toll free (1-800-FOR-NOAA) phone number painted on them. This phone number rings directly to the CO-OPS Chesapeake office. After hours, the answering system is activated; messages are checked each morning.
 - iii. Try to establish a local contact or field contractor to assist and/or be compensated to recover the current meter, as outlined in section 6A.



- b. Failed Release - If the correct acoustic signal has been sent to the release and the pod or float has failed to surface, follow these procedures:
 - i. The model 867A release (currently used on most bottom-mounts) responds back to with a confirmation signal, verifying if the release mechanism has triggered. This confirmation assures the release is working properly and is either open or not. The 875 release does not send a confirmation of the release opening.
 - ii. Wait: If the release is confirmed as open, it may be a matter of time before a blockage or fouling allows the float to surface. The current (i.e., change in the tide) will sometimes disengage the release mechanism from the bottom-mount's base, allowing it to float to the surface.
 - iii. Grapple: Weighted tag lines are usually placed near the bottom mounts and laid out away from the station's position with known coordinates; the tag line should be laid out going across the channel (along the minor axis of flow). Using a form of a grappling hook, try to snag for the tag line by dragging the grapple on the bottom across the tag line location. Rocky bottoms or subsurface obstructions may catch the grapple and make this method difficult. Deeper waters will require extra weight and longer line for the grapple. Successful recovery is more likely if the following guidelines are followed:
 - 1. Slow speed
 - 2. The correct weight to keep the grapple on the bottom
 - 3. A long enough line (~3x the water depth) on the grapple to allow the grapple to be in contact with the bottom while underway.
 - iv. Dive: When all other methods fail to recover the bottom mount, divers (Contract or NOAA divers) will be required to perform a dive at the location of the current meter. Divers are the most expensive and time consuming option, so all other options should be exhausted first. Again, inquire about the finances available for a dive. A team of divers are usually required and OSHA safety precautions must be adhered to in order to legally proceed with a dive operation. This SOP does not delineate the safety precautions necessary to properly dive for the recovery of a current meter. Each dive team may have different criteria for conducting a safe and successful dive, but ALL must adhere to OSHA and [NOAA Dive Office](#) requirements. A few common methods used for diver-recoveries include:
 - 1. Acoustic hand-held 'pinger locator's' can be used to determine the location of the platform and allow the diver to find the pinger, which hopefully is still attached to the current meter and/or housing.
 - 2. Dropping a correctly weighted line with an attached surface buoy at the known or suspected position of the current meter can allow the diver to go down the line and conduct a radial search from the weight on the bottom.
 - v. Non-responsive Release - If the correct acoustic signal has been sent to the release, and the release does not respond, the release could be buried or damaged.



1. If a pinger is attached to the platform, range on the pinger.
 2. If that fails, transit over the known GPS location to collect bathymetric soundings of changes in depth. This should help to pinpoint the buried platform if it is still there. If it appears that the platform is there:
 - a. Deploy float in known location of platform for divers to use as a starting point.
 - b. Divers: follow the same diving procedure given above.
7. **Quality Assurance/Control**: Premature and failed releases require a coordinated effort to recover the current meter. Money, time and effort will be used during the operations. Forming a team to aid the field work is necessary. Management needs to be informed of money spent and time used. Someone should monitor the Argos signals and keep the field party and CO-OPS management informed of what is transpiring. If these procedures are not successful then further steps will need to be investigated and some creativity may be necessary. Local NOAA NRT boats are sometimes equipped with side-scan sonars that may be used to search for the platforms. Local boats can be contacted to keep an eye for any surfacing of the floats. If possible recovering the current meter out of the platform is preferable to getting no data at all. Sometimes platforms are just lost at sea.
8. **Management/Responsibility**: The field and project lead are responsible for informing management and the CECAT team lead of any expenditure of funds and time. The field lead is responsible for conducting the field recovery efforts.
9. **Glossary**
Float - the buoyant pod of a TRBM that contains the current meter, or the buoyant circular float/buoy that are attached to the ES2 or mTRBM mount.

OSHA - the [Occupational Safety and Health Act of 1970](#)

Pycnocline - A large density gradient in the water column caused by a combination of temperature and salinity change causing lighter water on top and denser water below. This density gradient can deflect sound to bend toward the lighter water. This can be checked with a CTD profile cast.