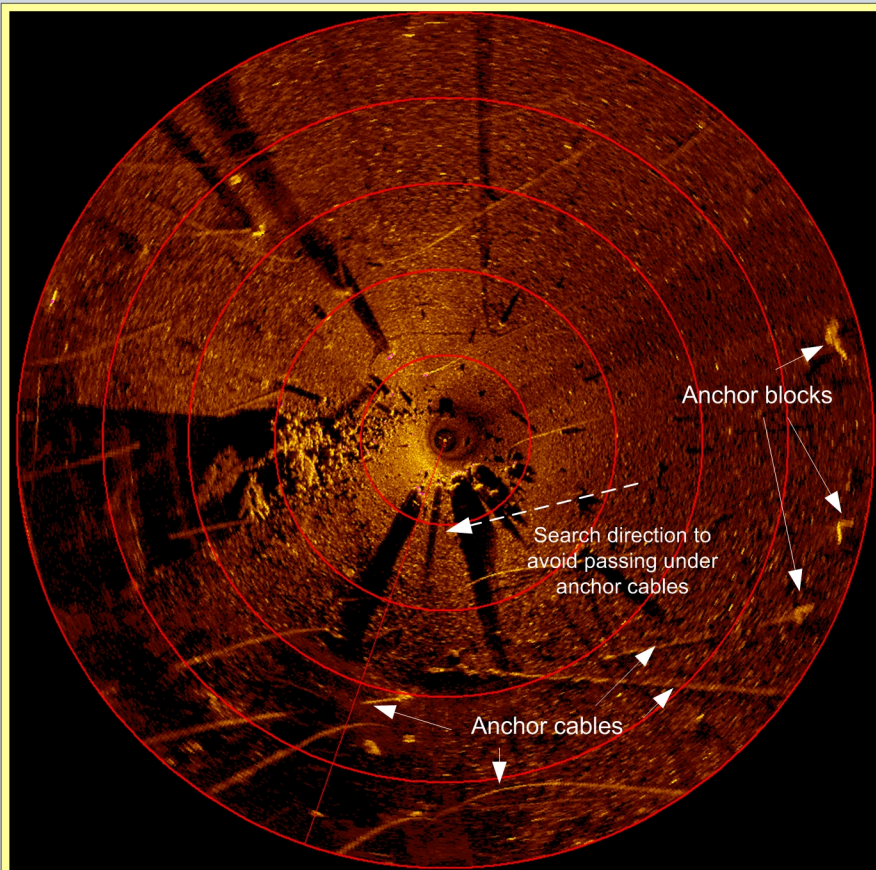
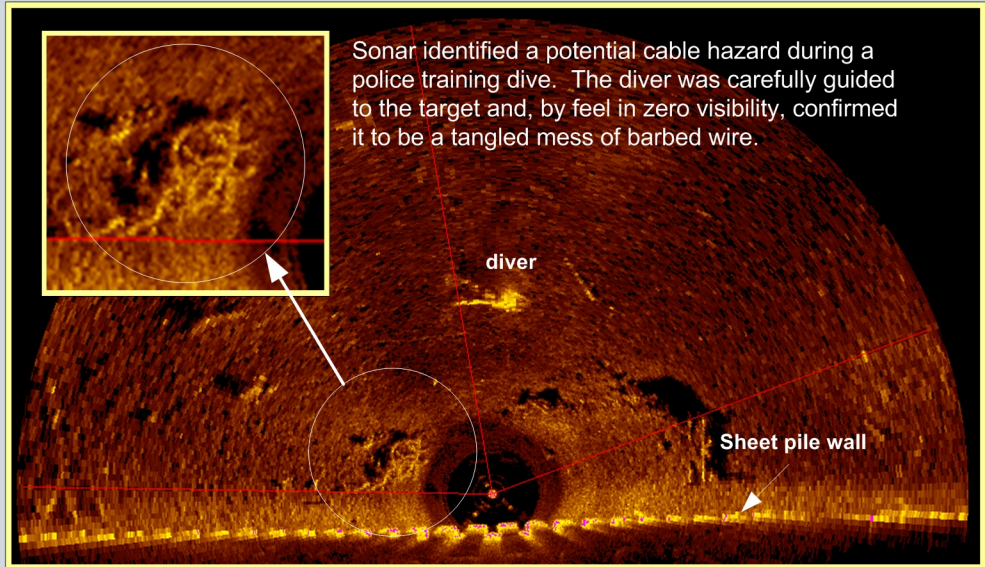


## Diver Safety and Sonar

The safest place for a diver is on the surface. Utilizing scanning sonar before the diver descends can identify potential hazards and provide critical information for effective dive planning. The most efficient use of scanning sonar for directing divers is when surface supplied air and hardwire communications are used.



Checking "coms" before commencing the dive



Sonar scan prior to the dive to check the alignment of anchor cable entrapment hazards

In the lower left sonar image, anchor cables attached to floating dock slips at a marina were hazards identified during a body search. The dive was planned (and monitored in real time on the scanning sonar display) so there was never a risk of the tethered diver being entrapped by swimming under the anchor lines.



Surface supplied helmet and band mask with hardwire communications





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## Sonar equipment configuration to direct divers in real time:

- Computer with MS 1000 PC-based Sonar Software
- "Splashproof" MS 1000 Interface Unit (operates with either a 120/240 VAC or 9-30 VDC supply voltage)
- Kevlar operations cable (75m-100m [255'-330'] recommended)
- 675 kHz High Resolution Scanning Sonar Head with fan beam transducer (or Multi Frequency High Resolution Sonar Head) with compass option
- Tripod
- Handcontroller



"Typical" MS 1000 System with a 100m (330') Kevlar operations cable used to direct divers.

## Directing Divers:

"Scanning sonar remains the most suitable tool to guide divers in real time. Deploy the unit before the diver enters the water to identify potential targets and hazards. The sonar operator *and diver* should review the sonar data and decide how to efficiently investigate each target of interest.

With the sonar head stable and in a fixed position close to bottom, an accurate, relative position search can be conducted without having to utilize a subsea tracking system. In addition to detecting targets, scanning sonar can be used to track the search pattern of the diver to verify the area has been thoroughly examined.

It is a simple process to direct a tethered diver that has communication with the surface. All directions are given with the diver facing their umbilical. *The task is more efficient if the dive tender can hear directions given by the sonar operator. Instruct the tender to maintain tighter umbilical control than is generally done in commercial dive operations. Inform the tender when the diver is moving toward or away from their umbilical so that the appropriate amount of umbilical is provided. When the diver is instructed to move left or right, the tender has to secure the umbilical and allow the diver to use it as a pendulum."*<sup>1</sup>

## Safe Diving Distances from Transmitting Sonar:

"There are potential health risks when a diver is working in close proximity to a transmitting acoustic source. The question of safety is most often, but not exclusively, encountered on military programs where high-powered naval sonars are of concern to anyone entering the water. An appendix in the *US Navy Diving Manual* is specifically dedicated to this topic. It is recommended this manual be in the personal library of every sport, commercial and public safety diver as it covers every imaginable diving topic.

The *US Navy Diving Manual* can be downloaded from the Internet. The section concerning sonar is found in *Volume 1, Appendix 1A: Safe Diving Distances from Transmitting Sonar*. Read this chapter!

The *US Navy Diving Manual* delineates low-frequency and high-frequency sonar (250kHz or greater), and details whether the diver is hooded, or using a dry diving helmet. Exposure time and SPLs are listed within the acceptable ranges. At the time of this writing, the manual states that hooded divers should not approach closer than two yards (1.9m/6.24') for a Personal Exposure Limit (PEL) of greater than 120 minutes to active sonar with a Sound Pressure Level (SPL) output of 215dB. There are no restrictions for high frequency sonars when the diver is using a dry helmet.

Immediately suspend diving operations if the diver feels any pain due to sound emitted from an active sonar or other sound source.

*The above information on Safe Diving Distances from Transmitting Sonar is an overview interpretation from the US Navy Diving Manual. It is the responsibility of diving contractors, public safety dive teams, dive supervisors and divers to review current codes, regulations and standards, and adhere to those that deal with diving in close proximity to active sonar."*<sup>2</sup>

1, 2 Quoted text courtesy **Echoes and Images, The Encyclopedia of Side-Scan and Scanning Sonar Operations**