



Marine Radio Communication San Francisco Area

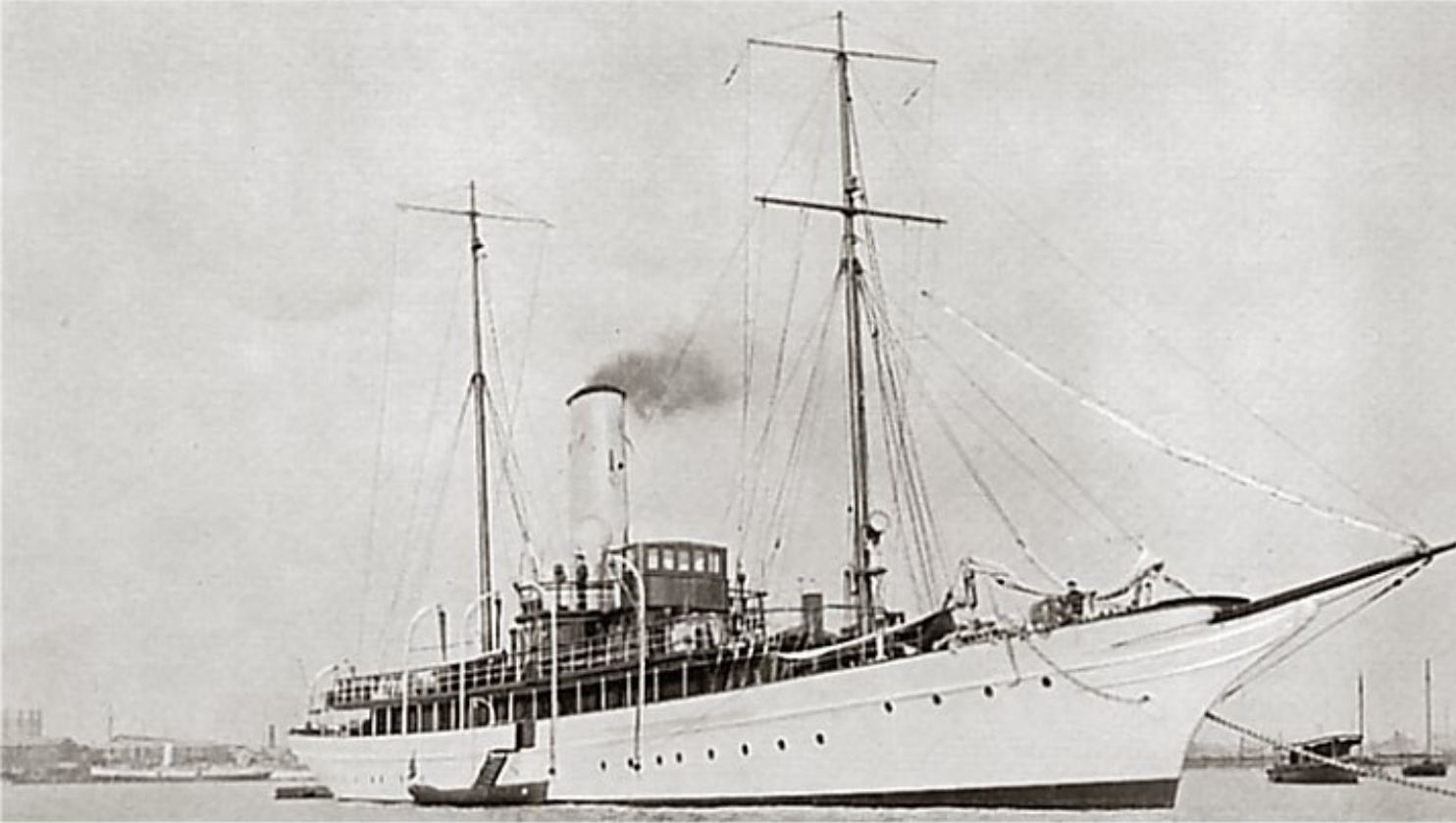
This presentation will give local amateur radio operators an overview of Maritime Radio in the San Francisco area. Topics include local history, MF/HF/VHF channel explanations, navigation, and how radios are used by Mariners and the Coast Guard.



I'm Kent Carter,
AJ6NI, showing you
a picture of me in
my happy place.

I'm honored to share with you this information I've learned. I have been sailing pretty much once a week for the last 6 years, and have obtained advanced Sailing Certifications from the American Sailing Association.





A Brief History of Marine Radio in the Bay Area

Marconi travelled on his own yacht, the Elettra, to the United States in 1899 to establish a radio empire, Marconi Wireless Telegraph Company of America

He arrived in New York in time to do radio reports for the 1899 America's Cup race between the US flagged *Columbia* and the UK flagged *Shamrock*. The *Columbia* won the regatta by winning the first 3 races in a 5 race series.

Marin County Station KPH

By 1913-14, Marconi had established the "[KPH](#)" [Pacific Rim station](#) in Marin County. KPH would broadcast regular bulletins of news, weather and other general information to the shipping community, then relay business and personal messages to and from individual ships. Station operators also monitored the international distress frequencies for calls from ships in trouble. The transmitter site was located just North of Bolinas, and the receiver site was located in Marshall on Tomales Bay, and was the foundation of the most successful and powerful ship-to-shore communications of its time.

After Marconi developed the "Short-Wave Beam System" in 1923 (what we now generally refer to as the HF bands), KPH's receiving site was moved to Point Reyes for better reception. This receiving site is now a [historical landmark and visitors center](#). The [Maritime Radio Historical Society](#) helps maintain the facility, give tours, and they even broadcast from there from time to time.



Skaggs Island Naval Communications Installation

Located in the wetlands of Sonoma County, this installation was built in 1941 to be a secretive, secure, and self-contained naval base, and engaged in a number of communications and intelligence gathering functions for the Navy and other federal intelligence organizations. It was used until the 1990s. In 2011, it became a part of the [San Pablo Bay Wildlife Refuge](#) and was razed shortly thereafter.

My Father, Radioman Jack Udseth, and who is also KT6R, was stationed there during the Korean War and would coordinate ships coming in and out of the Bay.





US Coast Guard Sector San Francisco

The headquarters of this Sector are located at the Southeastern end of Yerba Buena Island. This cove has been a military base since 1867. After WWII, it became a Coast Guard station. Vessel Traffic Services, our main point of interest, is located on Yerba Buena Island as well, and coordinates vessel activity off shore and in the Bay.

There is also a vessel station at Ft. Baker (under the North end of the GG Bridge), helicopter station at SFO, and a fixed wing air station in Sacramento. The Coast Guard claims they get to anywhere in the San Francisco Bay within 5 minutes.



Marine Radio Communications

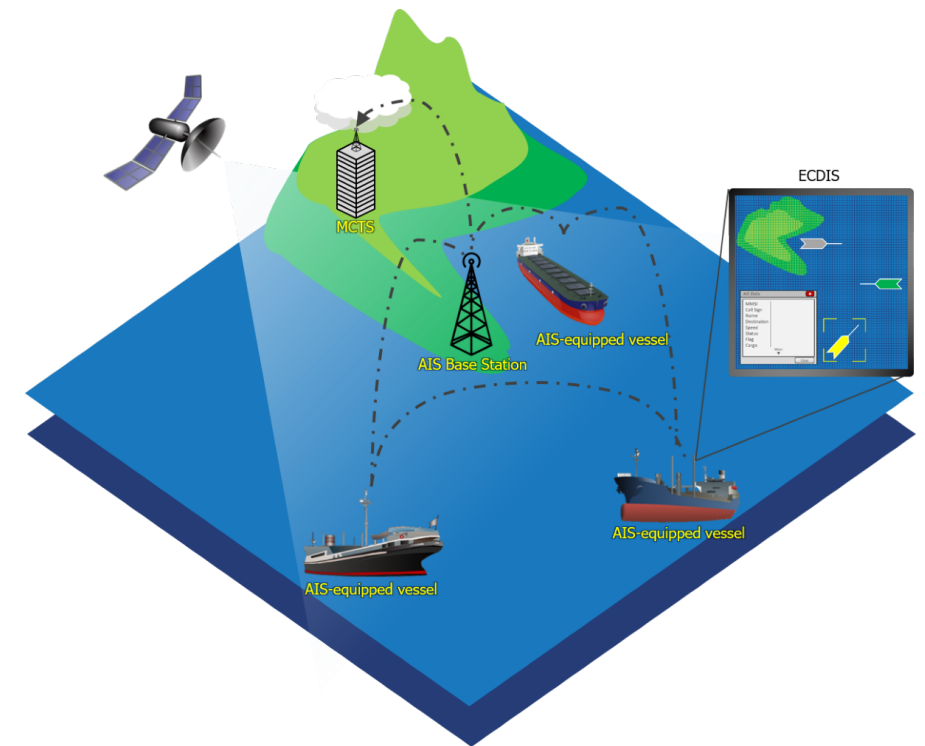
- VHF FM Radio is required for all commercial vessels and recreational vessels over 64 feet in length. Most vessels of all kinds on the Bay have one, though, regardless of size.
- Four types of communication: Emergency, Announcements, Commercial, Recreational.
- No personal license required.
- VHF FM Marine channels are typically used for Coastal and Bay communication. MF and HF SSB channels are used for DX.
- AM and some Digital Modes are also used.

Digital Select Calling (DSC)

- DSC is a requirement for any commercial vessel and now widely used in the MF, HF and VHF bands. The main benefit is that DSC extends the signal range.
- Information sent will include the ship's Maritime Mobile Service Identification (MMSI) number, MMSI of the unit being called, time, GPS coordinates, requested working frequency and mode, priority of call (Distress, Urgent, Safety, Routine), and in some radios, the type of emergency (e.g. fire, collision, MOB, piracy).
- Radios have an Alert Button which will send a Distress Call to the Coast Guard and anyone else listening.
- VHF DSC communications are on a dedicated Marine FM Channel, 70 (156.525 MHz) .
- DSC uses 10 bit error correcting code using FSK modulation. Tones are 1300 and 2100 Hz at 1200 Baud.

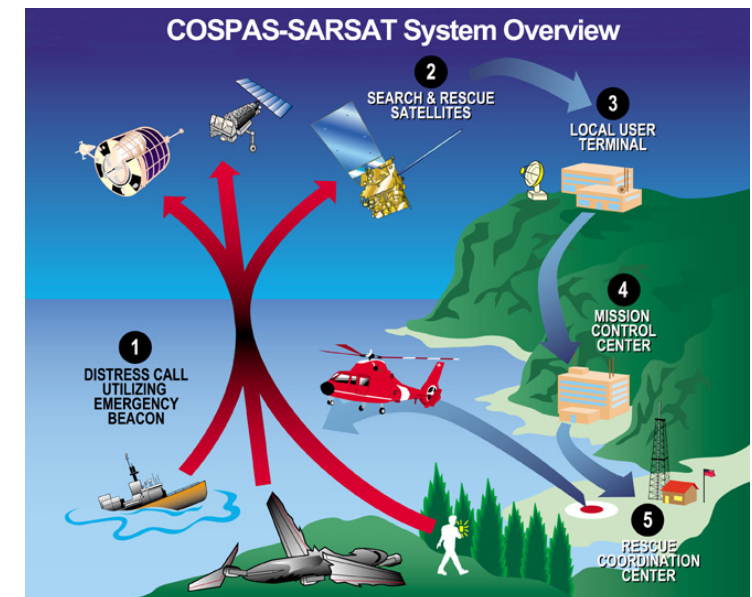
Automatic Identification System (AIS)

- Not too dissimilar to APRS.
- AIS Transceiver consists of one VHF transmitter, two VHF Time Division Multiple Access receivers, and one VHF DSC receiver.
- Messages use GMSK modulation at 9600bit/s on two 2 dedicated Marine Channels (87B and 88B) using High Level Data Link Control packet protocol and are time multiplexed.
- Messages include the vessel's name, MMSI, GPS Coordinates, course, speed and Navigation Status (anchored, under way, not under command) and other information. They are sent every 2-10 minutes.
- Messages are received by other ships, shore-based AIS receivers, aircraft and satellites and rebroadcast as part of a mesh network, greatly increasing range.
- Vesselfinder.com



EPIRBs (Emergency Position Indicating Radio Beacon)

- Beacon is activated manually or by water, and transmits a 5W alarm signal at 406MHz with a unique identification code every 50 seconds.
- The alarm signal is an AM signal containing a swept tone ranging from 1600 Hz to 300 Hz (downwards), with 2-4 sweeps per second.
- Some models will include GPS and the MMSI in the message. Some have an AIS transmitter built in.
- SAR satellites locate the beacon using doppler triangulation, then pass the info along through appropriate channels. No beacon is ever ignored.
- Purpose of system is to find survivors within the "Golden Day" aka 24 hours.
- Cost Range: \$500 - \$1,000. Most are not much bigger than an HT.



VHF RADIOS



Marine VHF FM HT

- Typically 5W
- Weather Channels
- Clip for placement on gear
- Waterproof
- Floats!

Cost: \$75 - \$200

Marine VHF FM Base Station

- 25W Max
- Weather Channels
- Built in GPS
- Some have AIS Transceiver
- DSC + Alert Button
- Waterproof

Cost: \$125 - \$1000

NOTE: Ham Radios Can Receive VHF Marine and Weather Frequencies

MF/HF Radios

- Common for vessels making ocean passages.
 - FCC License Required and is attached to vessel, not operator. No test, only fee is required.
-
- Can come with GPS, AIS Features
 - 1DSC + Alert Button.
 - Typically SSB and AM but may include other modes.
 - Using SSB, can Receive Weather Faxes from NOAA with a computer and audio interface.
 - Using SSB, can send and receive email with a PACTOR modem/computer and a service like Sailmail (costs money, but commercial use OK) or Winlink (free, but non-commercial uses only)
 - 150W is typical.
 - \$1,200 - \$3,000 Price Range
 - Becoming less popular with the price of Satellite Phones coming down.



NOTE: Ham Radios Can Receive MF/HF Marine Frequencies



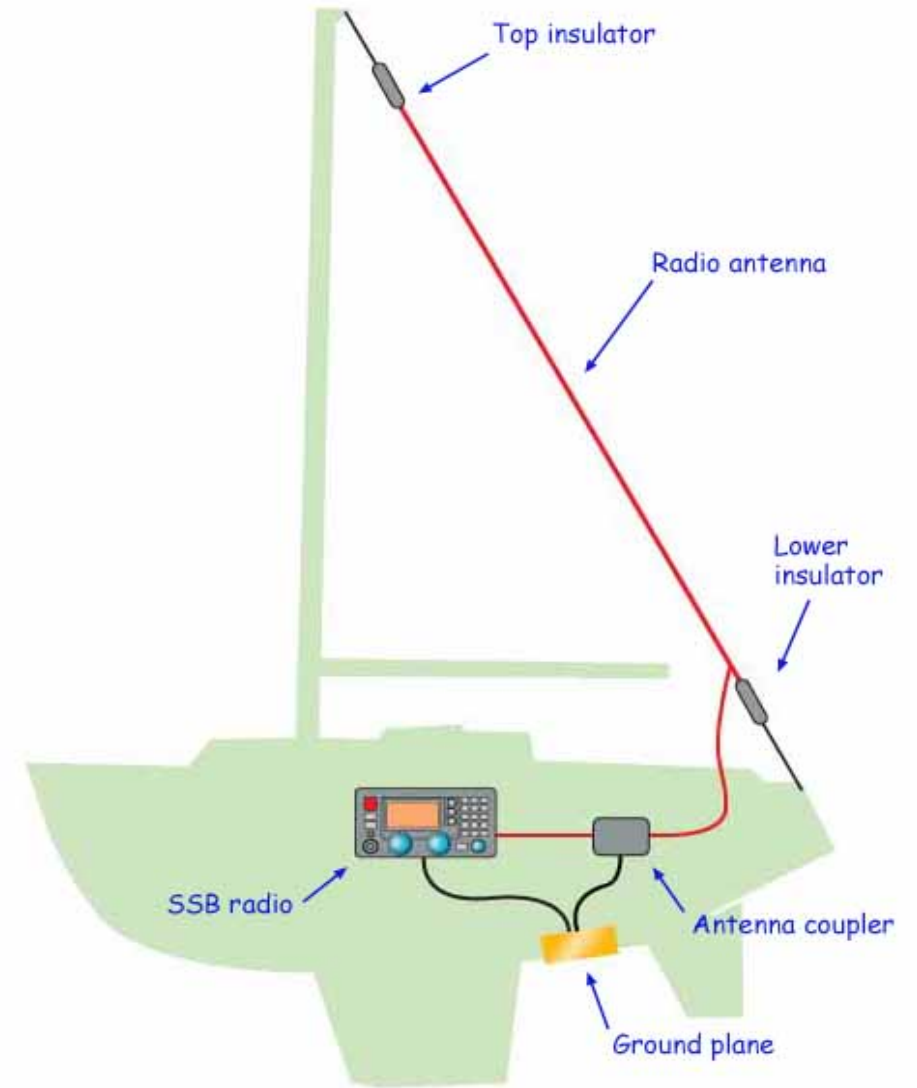
Antennas

VHF Verticals

- Placed on highest point on a boat, for sailboats they go on top of mast.
- Verticals that range in size from 15" to 17' 4"
- Cost range is \$50 - \$400

MF/HF Antennas

- Short whips are placed on highest point on boat. Longer ones are typically placed on the transom (back of the boat). Size ranges from 3.3 ft to 33 ft.
- A grounding plate (typically bronze) is required as a counterpoise.
- Sailboats can take advantage of their mast by using their backstay as a Sloper antenna.
- Cost range is \$60 - \$500.



MF/HF SSB Marine Frequencies

- There are many frequencies designated as channels in 17 different bands.
- Almost always USB.
- Coast Guard Distress Frequencies are 4.125, 6.125, 8.291 and 12.290 MHz.
- West Coast Weather is 13.282 MHz.

Bay Area Marine VHF FM Weather Channels

Channel	Frequency (MHz)	WX Area	Transmitter Name	Power
WX1	162.550	Monterey	Mt. Umunhum	330W
WX2	162.400	San Francisco	Mt. Pise	500W
WX3	162.475	Sonoma County	Sonoma County	300W
WX4	162.425	Contra Costa County	Mt Diablo	100W
WX5	162.450	Monterey Marine	Mt. Umunhum	100W
WX6	162.500	N. San Francisco Bay	Big Rock Ridge	100W
WX7	162.525	Ukiah	Laughlin Ridge	?

Marine VHF FM Channels for Communication

There are over 50 VHF Channels used in the Bay Area.

We will just be focusing on the ones that are used the most.

Channel	MHz	Description
12	156.600	Offshore Vessel Traffic Service (VTS)
13	156.650	Ship to Ship (Pilots and Tugs to Ships)
14	156.700	Inshore Vessel Traffic Service (VTS)
16	156.800	International Distress, Coast Guard Monitored, also Vessel to Vessel Hailing
21A	157.050	Coast Guard Communications
22A	157.100	Coast Guard Communications - Most Used
23A	157.150	Coast Guard Communications
68	156.425	Non-Commercial
69	156.475	Non-Commercial
71	156.575	Non-Commercial
72	156.625	Non-Commercial (Intership Only)
83A	157.175	Coast Guard Communications

Types of Calls on Channel 16

Ship Hailing

Once contact is made, a switch to a different channel is required.

Distress Call

1. Securite´ - Warning, Awareness
2. Pan Pan - Assistance Needed, Non-Life Threatening
3. Mayday - Assistance Needed, Potentially Life Threatening

Call Protocol: *"Distress level 3xs, Vessel Name & Description, Location, Nature of Issue"*

After the Coast Guard Responds, they usually move the caller to channel 22A, and sometimes 21A or 23A.

The Coast Guard is able to triangulate a radio signal location if the transmission is long enough.



Marine Communication Terms

Knot - A nautical mile and equals 1.15 land based miles. 1 knot is also equal to 1 minute of Latitude.

Heading - Compass-based 3 digit number representing direction the vessel is pointing towards.

Course - Compass-based 3 digit number representing the intended path of travel.

Bearing - Compass-based 3 digit number representing direction of another object or location.

TSS - Traffic Separation Scheme. A maritime traffic-management route-system, typically defined traffic lanes for vessels in a busy area.

Waypoint - A reference point (typically a set of GPS Coordinates) for vessels for location and navigation.

**Compass readings are always followed by "True" or "Magnetic." San Francisco's magnetic variation to Magnetic North is 14 degrees to the east.



San Francisco Sea Buoy

Offshore San Francisco VTS - Channel 12

Offshore San Francisco VTS only deals with the TSS to the West of the Golden Gate Bridge.

VTS Traffic Updates are broadcast every :15 and :45 past the hour. They include vessel name, location in the Offshore TSS, speed in knots, and estimated time to a buoy or waypoint.

Communication between vessels and VTS also happens any time a vessel enters or leaves the Offshore TSS.

Offshore San Francisco Specific References

San Francisco Sea Buoy is circled by November (North) Buoy, Whisky (West) Buoy, Sierra (South) Buoy

Northwest-Bound Traffic Waypoints 6N, 5N

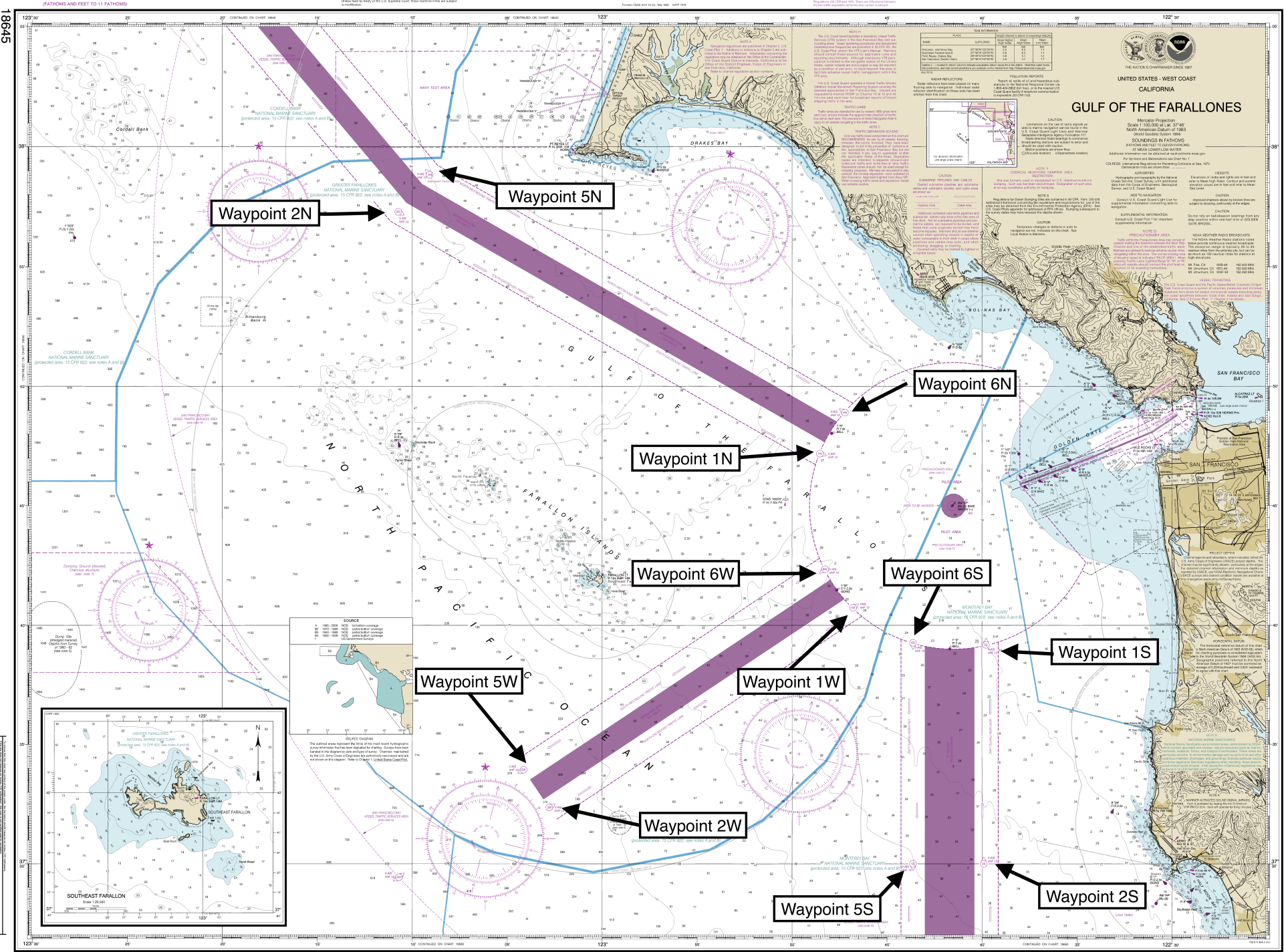
Southeast-Bound Traffic Waypoints 2N, 1N

Southwest-Bound Traffic Waypoints 6W, 5W

Northeast-Bound Traffic Waypoints 2W, 1W

South-Bound Traffic Waypoints 6S, 5S

North-Bound Traffic Waypoints 2S, 1S

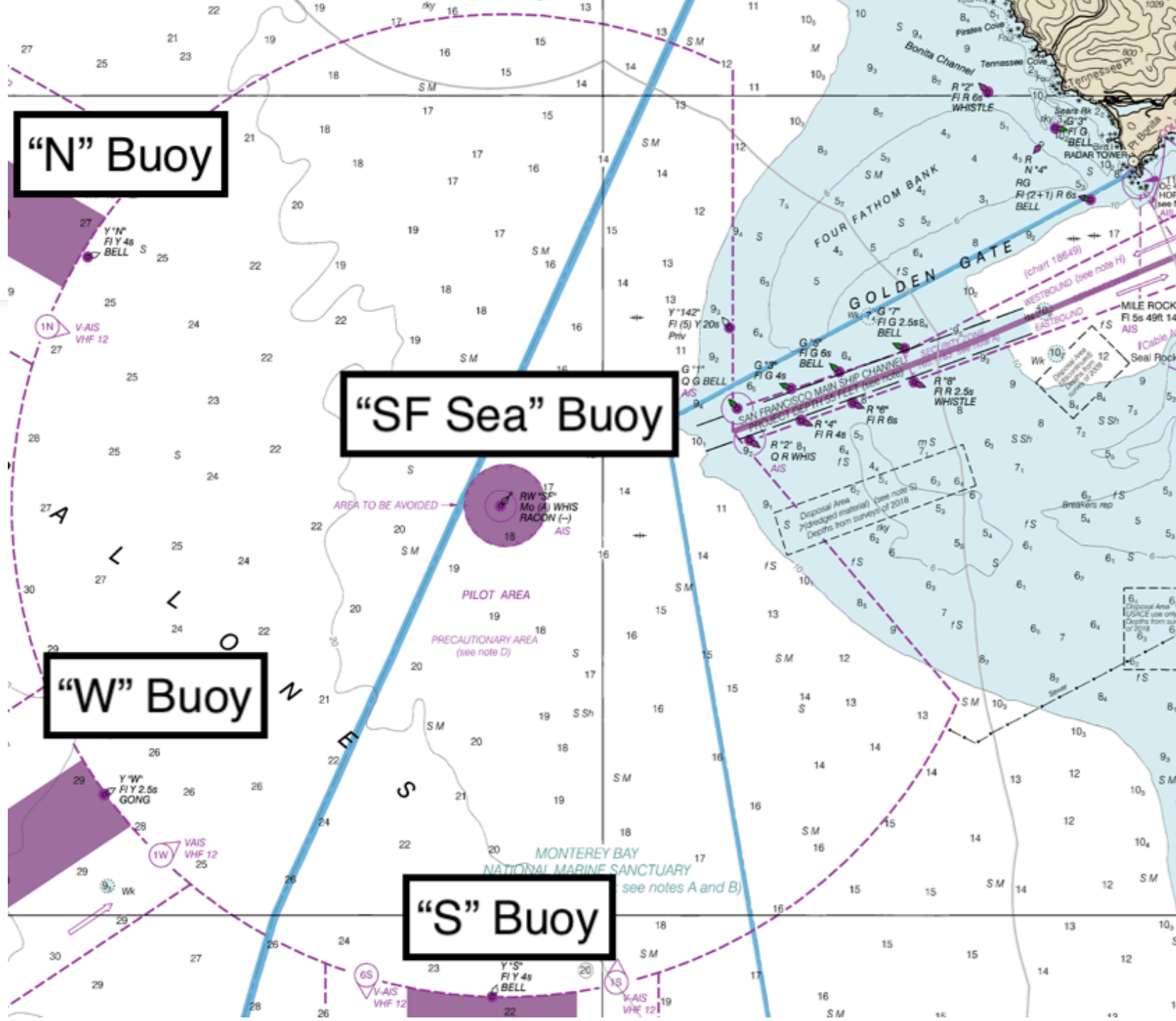


"N" Buoy

"SF Sea" Buoy

"W" Buoy

"S" Buoy





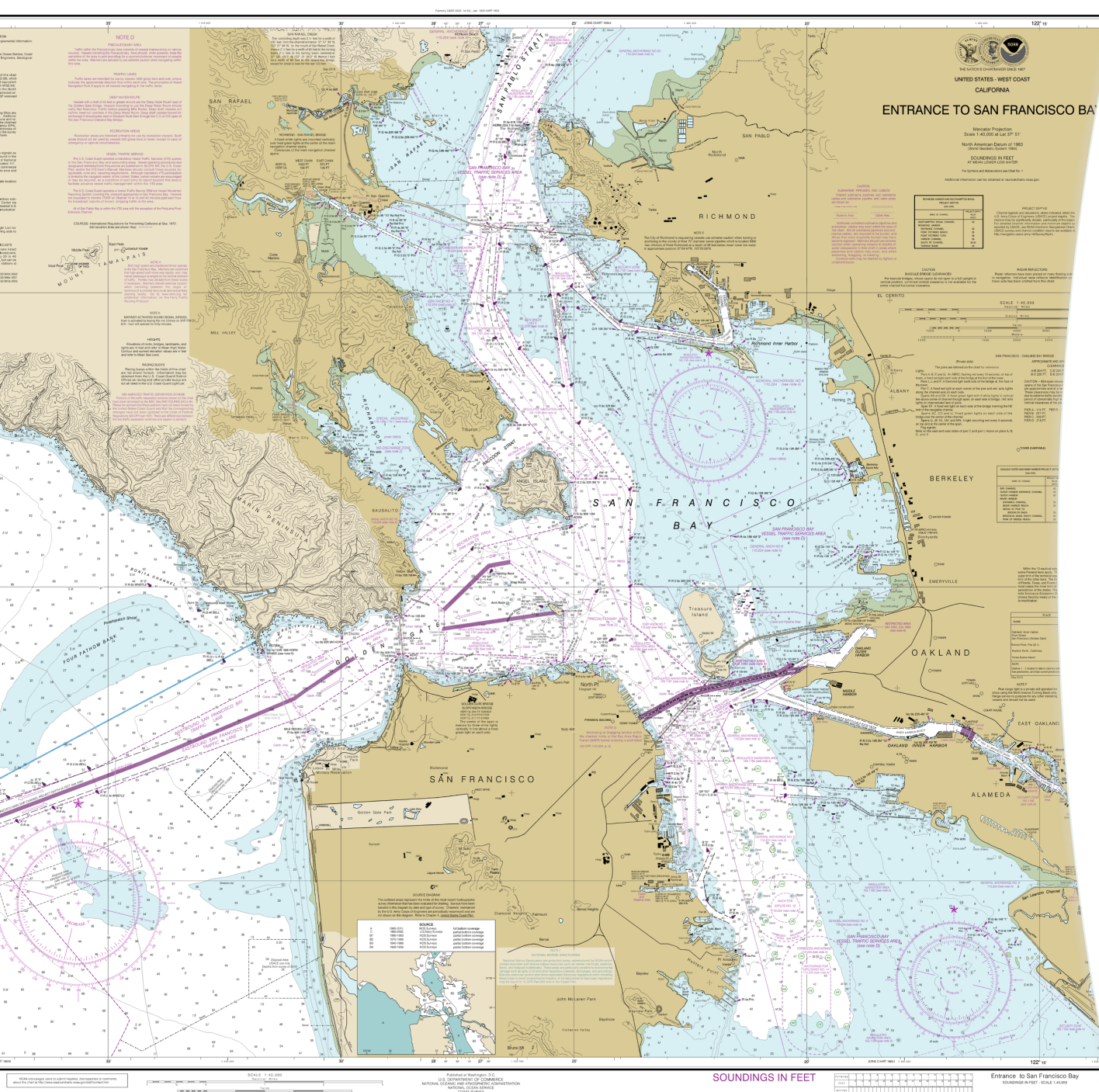
Only Bar Pilots Can
Bring Large
Vessels Into the
Bay.

The San Francisco Bar can be treacherous.

Pilot Boats, as well as Tugs, communicate with the Vessels on Channel 13 to coordinating the load and unload Bar Pilots.



MARINE ONLINE...



SF Bay VTS - Channel 14

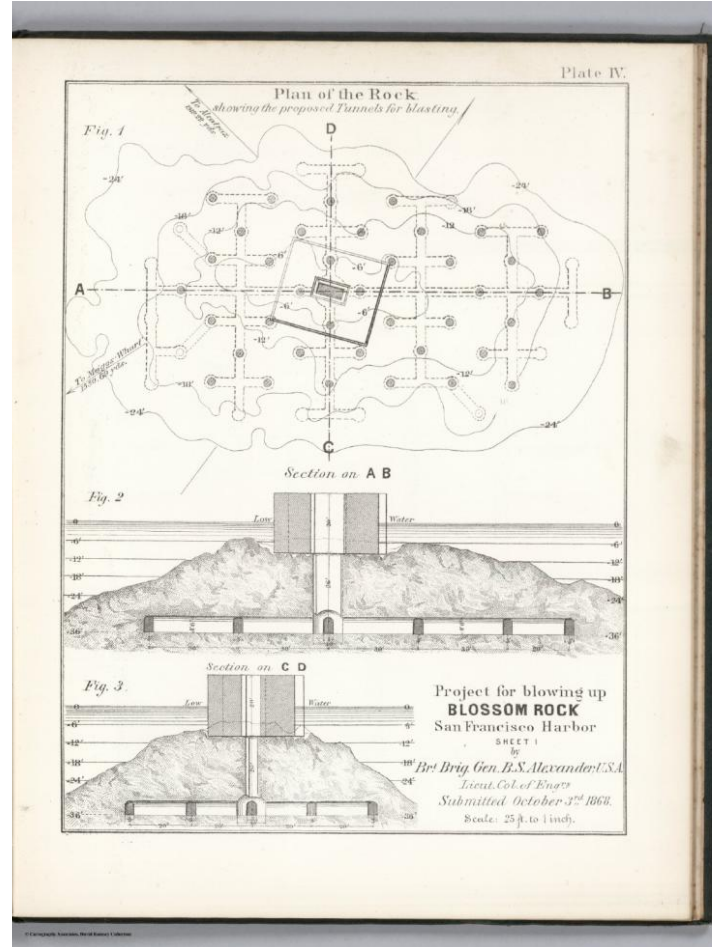
- Bar Pilots will bring vessels into the Bay using the North Bound of South Bound Channels.
- They will call SF Bay Vessel Traffic Services with route, speed, vessel draft, and destination.
- Most destinations are to the Port of Oakland or Richmond, and sometimes San Francisco, Benecia, or the Delta. Deep water channels can take vessels all the way to Stockton or Sacramento.
- Most vessels will spend some time in the anchorage South of the Bay Bridge.
- SF Bay VTS is also contacted when vessels are leaving and will state the path they intend to take.
- SF Bay VTS also coordinates Ferries, Tugs and Barges.

Buoys of the Bay

- Harding Rock marks the Southern edge of the deep water channel.
- This photo shows the strong Bay Currents that are always taken into account for navigational purposes.



Blossom Rock



Blossom Rock marks the Southern edge of the alternative Southern Channel.

History

Blossom rock was only 5 feet underwater during low tide and a big hazard to shipping. In 1868, plans were drawn to blow it up.

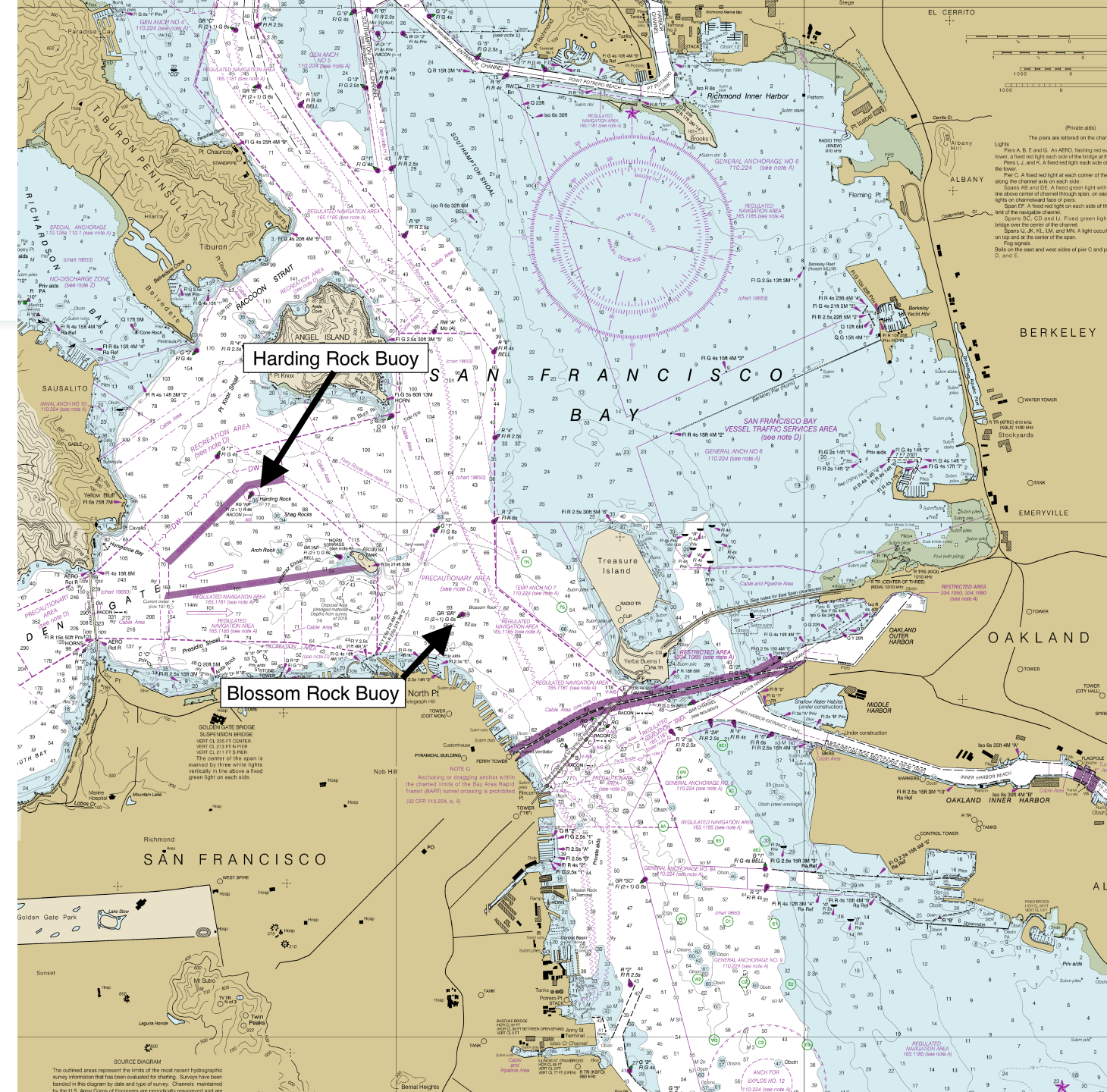
Kaboom!

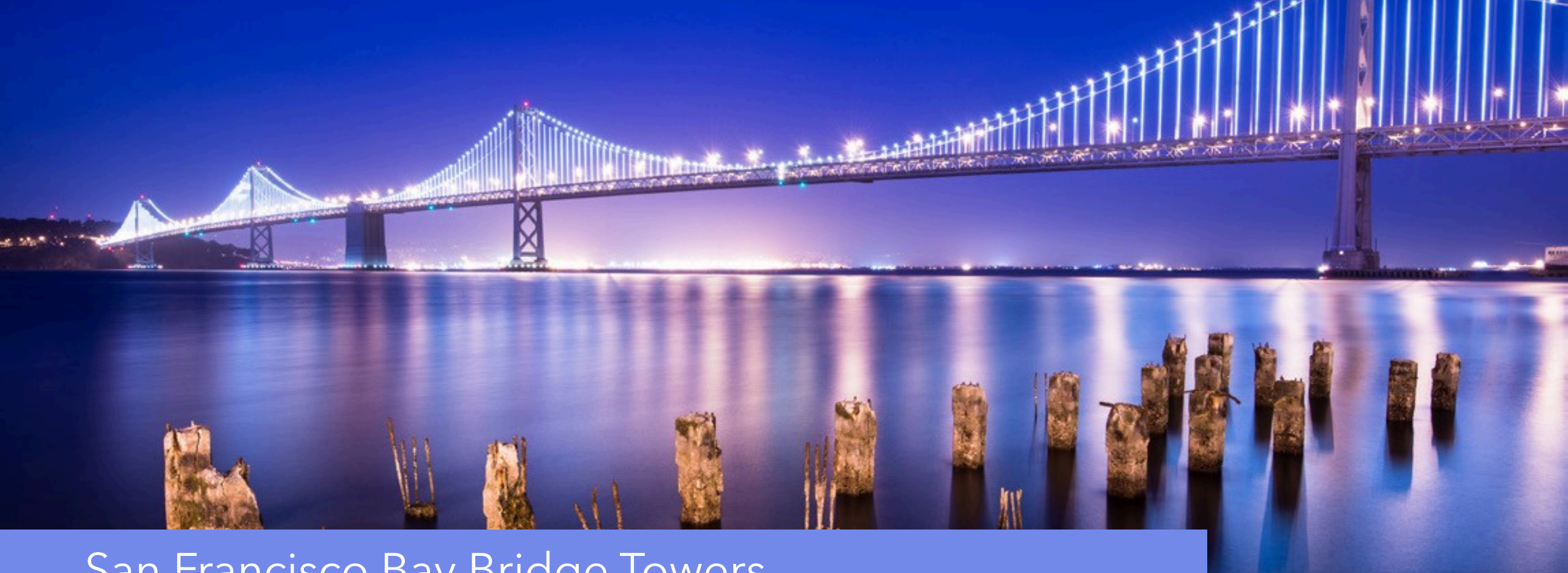
To watch its explosion, San Francisco experienced its largest public gathering up to that time.



BLOWING UP BLOSSOM ROCK, SAN FRANCISCO HARBOR.—FROM A SKETCH BY L. H. TOWNSEND.—[SEE PAGE 234.]





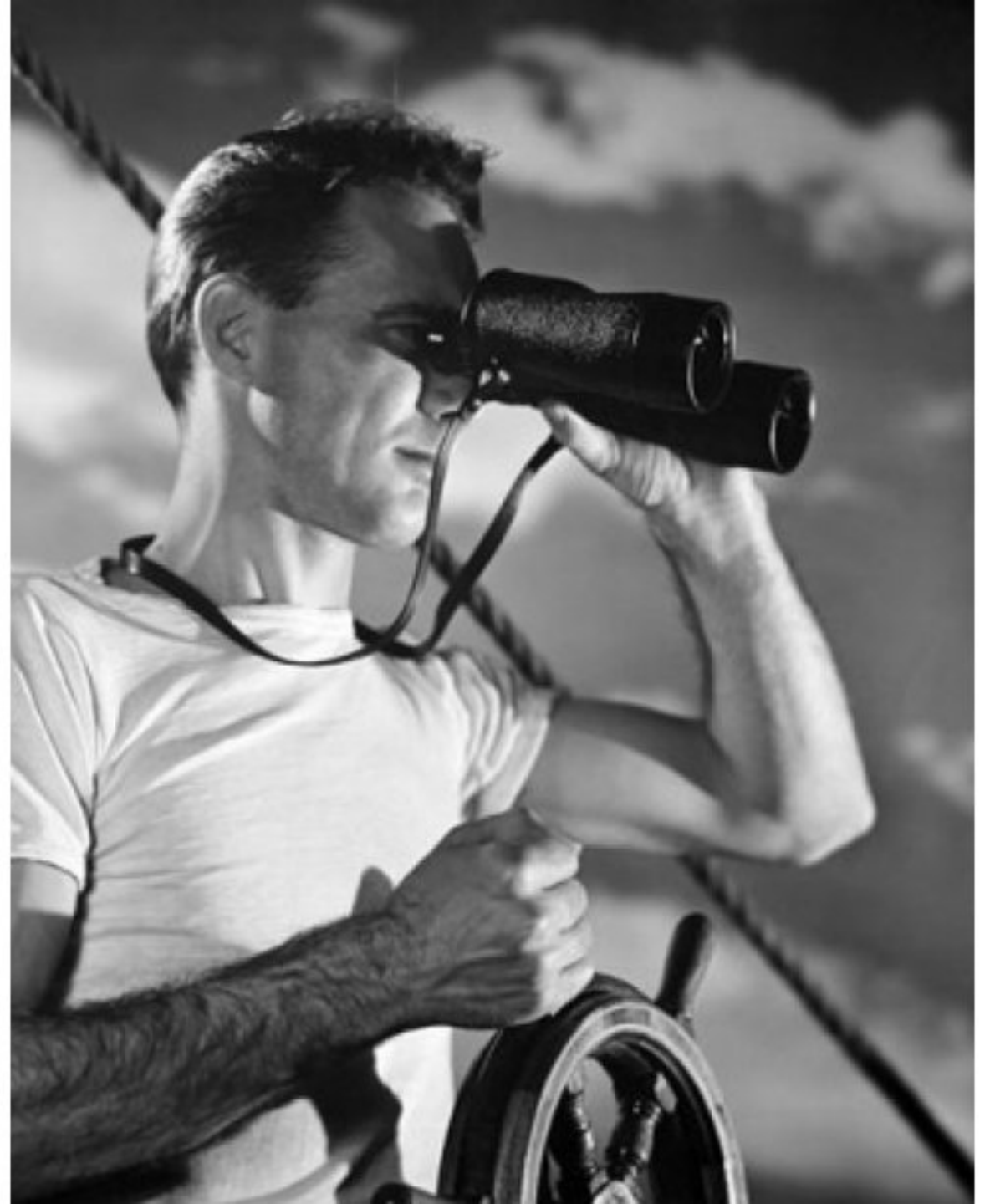


San Francisco Bay Bridge Towers

They are named Alpha through Echo, with Alpha being closest to the City. Charlie Tower is the big concrete stump in the middle.

Large Vessels and everyone else on the Bay

So... why do recreational sailors need to know so much about large vessel traffic?





WE DON'T WANT TO GET RUN OVER

- Large cargo ships can take up to 20 minutes, travelling several miles, to stop.
- Overall they are not very maneuverable and can only go so many places in the Bay, thus they always have the right of way.
- If they interfere with your race, tough luck.
- Cargo ships will often make themselves known by one long horn blast.
- 5 short horn blasts means a collision is likely unless other boats alter their course.
- Interfering with the course of a large vessel can bring a fine upwards of \$15,000.

Recreational Boating

Sailors communicate on Channels 68, 69, 71 and 72, typically on HTs.

Race starting sequences are 5 minutes long (with warning signals at 4 minutes and 1 minute) and are often the most exciting part of the race. The parking lot between St. Francis and Golden Gate Yacht Clubs on most Saturday or Sunday mornings is a great place to watch and listen to the starts.



Hams and Marine Radio

Overall the Coast Guard's services are quite impressive. How can we help?

- Anyone can purchase and use a VHF marine radio. The Coast Guard often asks for help from people in the area of an incident on Channel 16. The Good Samaritan Law says you will not be liable if you are helping someone in distress.
- Report large objects in the water on Channel 16 that could be a hazard to craft.
- Get the Citizen App and grab binoculars when someone is missing at Ocean Beach.

Other ways for hams to get involved:

- Farallons Race needs radio volunteers to help with VHF communications.
- BOTA - Should we start this?
- Contact me: kc@kentcarter.com - 415-710-7575



Radios on a Boat!

