U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*
COAST AND GEODETIC SURVEY
H. Arnold Karo, *Director*

VK
947
.N3
9th ed.
(1963)

UNITED STATES COAST PILOT 7

PACIFIC COAST

California, Oregon, Washington, and Hawaii

Ninth (June 15, 1963) Edition

Corrected through NM–24/63

CENTRAL
LIBRARY
SEP 15 1983
N.O.A.A.
U. S. Dept. of Commerce

United States Government Printing Office, Washington : 1963

For sale by the Coast and Geodetic Survey and its sales agents

National Oceanic and Atmospheric Administration

Climate Data Modernization Program

ERRATA NOTICE

One or more conditions of the original document may affect the quality of the image, such as:

Discolored pages
Faded or light ink
Binding intrudes into the text

This document has been imaged through the NOAA Climate Data Modernization Program. To view the original document, please contact the NOAA Central Library in Silver Spring, MD at (301) 713-2607 x124 or www.reference@nodc.noaa.gov.

LASON
Imaging Contractor
12200 Kiln Court
Beltsville, MD 20704-1387
October 29, 2003

Blank page retained for pagination

Preface

United States Coast Pilot 7, Pacific Coast—California, Oregon, Washington, and Hawaii—Ninth (June 15, 1963) Edition, is based mainly upon the work of the Coast and Geodetic Survey but also includes material supplied by the Coast Guard, the Corps of Engineers, and the Weather Bureau.

Most new editions of Coast Pilots are written only after thorough field inspection by special Coast Pilot ship or shore parties. Coastal inspection of California, Oregon, and Washington was made in May–November, 1962, by Navigation Specialist William A. Dennis, USC&GS, who supplemented his station-wagon observations with notes made while aboard various public and private vessels operating in the area. Revision material for Hawaii was furnished by Captain Wilbur R. Porter, Honolulu District Officer, USC&GS, in early 1963.

The Survey welcomes criticism of its Coast Pilots; write to Director, Coast and Geodetic Survey, U.S. Department of Commerce, Washington, D.C., 20230.

JOHN A. MCCORMICK,
Chief, Coast Pilot Branch.

Blank page retained for pagination

Contents

		Page
Preface		III
Chapter 1.	General Information	1
Chapter 2.	Navigation Regulations	12
Chapter 3.	California, Oregon, and Washington	86
Chapter 4.	San Diego to Point Arguello, California	93
Chapter 5.	Channel Islands, California	106
Chapter 6.	Point Arguello to San Francisco Bay, California	114
Chapter 7.	San Francisco Bay, California	123
Chapter 8.	San Francisco Bay to Point St. George, California	138
Chapter 9.	Chetco River to Columbia River, Oregon	151
Chapter 10.	Columbia River, Oregon and Washington	164
Chapter 11.	Columbia River to Strait of Juan de Fuca, Washington	177
Chapter 12.	Straits of Juan de Fuca and Georgia, Washington	187
Chapter 13.	Puget Sound, Washington	207
Chapter 14.	Hawaii	229
Appendix		273
Index		299
Chart diagrams		(follow Index)
Conversion Tables		(last page)

1. GENERAL INFORMATION

UNITED STATES COAST PILOTS.—The C&GS Coast Pilots are a series of eight nautical books that cover a wide variety of information important to navigators of United States coastal and intracoastal waters. Most of this book information cannot be shown graphically on the standard nautical charts and is not readily available elsewhere. Coast Pilot subjects include navigation regulations, outstanding landmarks, channel and anchorage peculiarities, dangers, weather, ice, freshets, routes, pilotage, and port facilities. A new edition of each Coast Pilot is published at intervals ranging from 4 to 10 years. Cumulative **Supplements**, containing changes reported since dates of editions, are published early each year and are distributed free.

Bearings.—These are true, and when given in degrees are clockwise from 000° (north) to 359°. Light-sector bearings are toward the light.

Bridges and cables.—Clearances of bridges and overhead cables are in feet above normal high water unless otherwise stated; clearances of drawbridges are for the closed position. These are the vertical clearances approved by the Nautical Chart Division, C&GS. They may be as-built, authorized, or reported; see latest prints of nautical charts for possible modifier. Also see charts for horizontal clearances of bridges; these are repeated in the Coast Pilots only when they are less than 50 feet and then only in terms of channel width or length of span.

Courses.—These are true and are given in degrees clockwise from 000° (north) to 359°. The courses given are the courses to be made good.

Currents.—Stated current velocities are the averages at strength. Velocities are in knots, which are nautical miles per hour. Directions are the true directions to which the currents set.

Depth units.—Depths are in feet or fathoms below the low-water tidal datum of the charts unless otherwise stated.

Distances.—These are in nautical miles unless otherwise stated. A nautical mile is 1 minute of latitude, or approximately 2,000 yards, and is about 1.15 statute miles.

Elevations.—These are in feet above the plane of reference used for that purpose on the charts.

Light and fog-signal characteristics.—These are not described, and light sectors are seldom defined. See Coast Guard Light Lists.

Radio navigational aids.—These are seldom described. See Coast Guard Light Lists.

Ranges.—These are not fully described. **"A 339° range"** means that rear range structure bears 339° from front structure. See Coast Guard Light Lists.

Winds.—Directions are the true directions from which the winds blow. Velocities are in knots, which are nautical miles per hour.

The **COAST AND GEODETIC SURVEY** is required to provide charts and related information for the safe navigation of marine and air commerce, and to provide basic data for engineering and scientific purposes and for other commercial and industrial needs.

District Offices of the Coast and Geodetic Survey are located at some of the principal ports in the United States; see Appendix. Files of charts, Coast Pilots, and other publications are maintained at these offices for the use of mariners, who are invited to avail themselves of the facilities afforded.

Sales agents for Charts, Coast Pilots, Tide Tables, Tidal Current Tables, and Tidal Current Charts of the Coast and Geodetic Survey are located in many ports of the United States and in some foreign ports. See Appendix for list of sales agents. The charts and books also may be purchased from the Washington Office or from the District Offices. Orders mailed to Washington, D.C., should be accompanied by check or money order, made payable to C&GS, Department of Commerce. Indexes of charts and books will be furnished free, upon receipt of request designating areas of interest.

Special signals for surveying vessels.—Pilot Rules for Inland Waters, § 80.33, state that by day a surveying vessel of the Coast and Geodetic Survey, underway and employed in hydrographic surveying, may carry in a vertical line, one over the other not less than 6 feet apart where they can best be seen, three shapes not less than 2 feet in diameter of which the highest and lowest shall be globular in shape and green in color and the middle one diamond in shape and white.

(a) Vessels of the Coast and Geodetic Survey shall carry the above-prescribed marks while actually engaged in hydrographic surveying and underway, including drag work. Launches and other boats shall carry the prescribed marks when necessary.

(b) It must be distinctly understood that these special signals serve only to indicate the nature of the work upon which the vessel is engaged and in no way give the surveying vessel the right-of-way over other vessels or obviate the necessity for a strict observance of the rules for preventing collisions of vessels.

(c) By night a surveying vessel of the Coast and Geodetic Survey, underway and employed in hydrographic surveying, shall carry the regular lights prescribed by the rules of the road.

(d) A vessel of the Coast and Geodetic Survey, when at anchor in a fairway on surveying operations, shall display from the mast during the daytime two black balls in a vertical line and 6 feet apart. At night two red lights shall be displayed in the same manner. In the case of a small vessel the distance between the balls and between the lights may be reduced to 3 feet if necessary.

(e) Such vessels, when at anchor in a fairway on surveying operations, shall have at hand and show, if necessary, in order to attract attention, a flare-up light in addition to the lights which are, by this section, required to be carried.

International Rules of the Road, Part B, Rule 4(c), states that a vessel engaged in laying or in picking up a submarine cable or navigation mark, or a vessel engaged in surveying or underwater operations when from the nature of her work she is unable to get out of the way of approaching vessels, shall carry, in lieu of the lights specified in Rule 2(a) (i) and (ii), three lights in a vertical line one over the other not less than 6 feet apart. The highest and lowest of these lights shall be red, and the middle light shall be white, and they shall be of such a character as to be visible all round the horizon at a distance of at least 2 miles. By day, she shall carry in a vertical line one over the other not less than 6 feet apart, where they can best be seen, three shapes each not less than 2 feet in diameter, of which the highest and lowest shall be globular in shape and red in colour, and the middle one diamond in shape and white.

The **wire drags** used by the Coast and Geodetic Survey in sweeping for dangers to navigation may be crossed by vessels without danger of fouling at any point except between the towing launches and the large buoys near them, where the towline approaches the surface of the water. Vessels passing over the drag are requested to change course so as to cross it approximately at right angles, as a diagonal course may cause the propeller to foul the supporting buoys and attached wires. No attempt should be made to pass between the drag launches while the wire is being set out or taken in, unless it would endanger a vessel to do otherwise, because the bottom wire is slack and the floats at each 100-foot section may lift it nearly to the surface; at this time the launches usually are headed directly toward or away from each other and the operation may be clearly seen.

Nautical charts are published primarily for the use of the mariner but serve the public interest in many other ways. They are compiled principally from Coast and Geodetic Survey basic field surveys, supplemented by data from other Government organizations.

The **scales of nautical charts** range from 1:2,500 to about 1:5,000,000. Graphic scales are generally shown on charts with scales of 1:80,000 or larger, and numerical scales are given on smaller-scale charts. Coast and Geodetic Survey charts are classified according to scale as follows:

Sailing charts, scales 1:600,000 and smaller, are for use in fixing the mariner's position as he approaches the coast from the open ocean, or for sailing between distant coastwise ports. On such charts the shoreline and topography are generalized and only offshore soundings, the principal lights, outer buoys, and landmarks visible at considerable distances are shown.

General charts, scales 1:100,000 to 1:600,000, are for coastwise navigation outside of outlying reefs and shoals.

Coast charts, scales 1:50,000 to 1:100,000, are for inshore navigation leading to bays and harbors of considerable width, and for navigating large inland waterways.

Harbor charts, scales larger than 1:50,000, are for harbors, anchorage areas, and the smaller waterways.

Special charts, various scales, cover the Intracoastal waterways and miscellaneous small-craft areas.

The **date of a chart** is of vital importance to the navigator. When charted information becomes obsolete, further use of the chart for navigation may be dangerous. Up-to-date charts should be obtained at regular intervals.

The **Mercator projection** used on most nautical charts has straight-line meridians and parallels that intersect at right angles. On any particular chart the distances between meridians are equal througout, but distances between parallels increase progressively from the equator toward the poles, so that a straight line between any two points is a rhumb line. This unique property of the Mercator projection is one of the main reasons why it is preferred by the mariner.

Echo soundings.—Most of the various types of echo sounder are calibrated for a velocity of sound in water of 800 fathoms per second, but the actual velocity may differ from the calibrated value by as much as 5 percent, depending upon the temperature and salinity of the waters in which the vessel is operating; the highest velocities are found in warm, highly saline water, and the lowest in icy, fresh water. Variation in line voltage can also cause errors of 10 percent or more in reading. Echoes can be obtained from schools of fish; in fact, trawlers are using the sounders for that purpose. The most serious error commonly occurs where the depth is greater than the scale range of the instrument; a 400-fathom scale indicates 15 fathoms visually and graphically when the depth is 415 fathoms. Where possible, wide variations from charted depths should be checked by wire soundings.

The **plane of reference** for depths on C&GS charts is the mean of all low waters for the Atlantic coast of the United States, including the West Indies, and the mean of the lower low waters for the Pacific coast, including the Hawaiian Islands and Alaska. The plane most frequently used on foreign charts is mean low water springs. The effect of strong winds, in combination with the regular tidal action, may at times cause the water level to fall considerably below the reference plane.

Compass roses on charts.—The annual change in variation gradually introduces an error in the magnetic compass roses on charts. The compass roses are replotted for every new edition of the chart if the error is appreciable; and the amount and date of the variation and the

amount of annual change are stated for each compass rose. On some of the sailing and general charts the magnetic variation is shown by isogonic lines.

Deviation of the compass.—The magnetic effect of the ship itself combines with any instrumental error of the compass to cause the deviation, which varies with the heading of the ship and with the magnetic latitude. It is customary to counteract the deviation as far as possible with soft iron and permanent magnets, suitably placed in or on the binnacle.

Local magnetic disturbance.—The charts show areas where the compass is disturbed by magnetic masses external to the ship. Such disturbances are fairly common in shallow waters but are never encountered over oceanic depths. Magnetic force diminishes so rapidly with distance that a magnetic center on land would have to be of unprecedented intensity to affect the compass of a vessel 0.5 mile from shore.

Overhead cables are shown on the charts and described in the Coast Pilots; the clearances given are for the lowest wires at high water. Vessels with masts, stacks, booms, or aerials should allow for an additional clearance under power cables equal to the distance between adjacent cables.

Submarine cable areas are shown on the charts but are not described in the Coast Pilots. Special effort should be made to avoid anchoring or trawling in cable areas. If a vessel does foul a cable, extreme care should be used when attempting to clear. Should normal methods fail, the anchor or other gear should be slipped and abandoned rather than risk breaking or cutting the cable. The high voltages in certain cables could cause severe burn or loss of life.

Tide Tables are issued annually by the Coast and Geodetic Survey in advance of the year for which they are prepared. These tables include predicted times and heights of high and low waters for every day in the year for a number of reference stations and differences for obtaining similar predictions for numerous other places. They also include other useful information such as a method for obtaining heights of tide at any time, local civil time of sunrise and sunset for various latitudes, reduction of local civil time to standard time, and time of moonrise and moonset for various ports.

Caution.—In using the Tide Tables, slack water should not be confused with high or low water. For ocean stations there is usually little difference between the time of high or low water and the beginning of ebb or flood currents; but for places in narrow channels, landlocked harbors, or on tidal rivers, the time of slack current may differ by several hours from the time of high or low water. The relation of the times of high or low water to the turning of the current depends upon a number of factors, so that no simple general rule can be given. To obtain the times of slack water, reference should be made to the Tidal Current Tables.

Tidal Current Tables for the coasts of the United States are issued annually by the Coast and Geodetic Survey in advance of the year for which they are prepared. These tables include daily predictions of the times of slack water and the times and velocities of strength of flood and ebb currents for a number of waterways, together with differences for obtaining predictions for numerous other places. Also included is other useful information such as a method for obtaining the velocity of current at any time, duration of slack, coastal tidal currents, wind currents, combination of currents, and current diagrams. Some information on the Gulf Stream is included in the tables for the Atlantic coast.

Tidal Current Charts are published by the Coast and Geodetic Survey for various localities. These charts depict the direction and velocity of the current for each hour of the tidal cycle. They present a comprehensive view of the tidal current movement in the respective waterways as a whole and when used with the proper current tables or tide tables supply a means for readily determining for any time the direction and velocity of the current at various localities throughout the areas covered.

The **COAST GUARD** has among its duties the enforcement of the laws of the United States on the high seas and in coastal and inland waters of the U.S. and its possessions; enforcement of navigation and neutrality laws and regulations and the Oil Pollution Act; inspection of vessels of the Merchant Marine; search and rescue; issuance of Merchant Marine licenses and documents; investigation of marine casualties and accidents, and suspension and revocation proceedings; destruction of derelicts; operation of aids to navigation, and publication of Light Lists and Local Notices to Mariners; and operation of ice breaking facilities.

Protection of navigable waters.—United States laws prohibit discharge from any vessel or shore establishment of any refuse matter, other than that flowing from streets and sewers in a liquid state, into any navigable water. It is not lawful to tie up or anchor vessels or to float log rafts in navigable channels in such manner as to obstruct normal navigation. When a vessel or raft is wrecked and sunk in a navigable channel it is the duty of the owner to immediately mark it with a buoy or beacon during the day and a light at night until the sunken craft is removed or abandoned. It is unlawful, except in emergency or by special permit, to discharge oil into coastal navigable waters from any vessel.

Light Lists.—Aids to navigation, consisting of lights, fog signals, buoys, lightships, daybeacons, and electronic aids, are described in the Light Lists, which are for sale by the Superintendent of Documents, Government Printing Office, Washington, D.C., 20402, and by sales agents in the principal seaports. Mariners should refer to these publications for detailed information regarding the characteristics and visibility of lights, and the descriptions of light structures, lightships, buoys, fog signals, and electronic aids.

Local Notices to Mariners.—Changes and deficiencies in aids to navigation maintained by or under the authority of the Coard Guard are published in Local Notices to Mariners issued by the District Commander of the area in which the aids are located. The local notices are

intended for local navigation interests operating within the limits of a Coast Guard district. Changes in aids to navigation of the United States are also contained in the weekly *Notice to Mariners*, prepared jointly by the Coast Guard and the Naval Oceanographic Office. The weekly notices are intended for mariners and others who have a definite need for them in connection with extended seagoing activities or for those operating in several Coast Guard districts.

Reporting of defects in aids to nagivation.—Promptly notify the nearest Coast Guard District Commander if an aid to navigation is observed to be missing, sunk, capsized, out of position, damaged, extinguished, or showing improper characteristics.

Radio messages should be prefixed "Coast Guard" and transmitted directly to any U.S. Government shore radio station for relay to the Coast Guard District Commander. If the radio call sign of the nearest U.S. Government radio shore station is not known, radiotelegraph communication may be established by the use of the general call "NCG" on the frequency of 500 kc. Merchant ships may send messages relating to defects noted in aids to navigation through commercial facilities only when they are unable to contact a U.S. Government shore radio station. Charges for these messages will be accepted "collect" by the Coast Guard.

Lights.—The visibility of lights is given in the Light Lists and shown on the charts. The distances may at times be increased by abnormal atmospheric refraction and may be greatly decreased by unfavorable weather conditions, such as fog, rain, haze, or smoke. All except the most powerful lights are easily obscured by such conditions. In some conditions of the atmosphere white lights may have a reddish hue.

Navigational lights should be used with caution because of the following conditions that may exist:

A light may be extinguished and the fact not reported to the Coast Guard for correction, or a light may be located in an isolated area where it will take time to correct.

In regions where ice conditions prevail the lantern panes of unattended lights may become covered with ice or snow, which will greatly reduce the visibility and may also cause colored lights to appear white.

Brilliant shore lights used for advertising and other purposes, particularly those in densely populated areas, make it difficult to identify a navigational light.

At short distances flashing lights may show a faint continuous light between flashes.

The distance of an observer from a light cannot be estimated by its apparent intensity. The characteristic of lights in an area should always be checked in order that powerful lights visible in the distance will not be mistaken for nearby lights showing similar characteristics at low intensity such as those on lighted buoys.

The apparent characteristic of a complex light may change with the distance of the observer. The characteristic as charted and shown in the light list may not be recognized until nearer the light.

Motion of a vessel in a heavy sea may cause a light to alternately appear and disappear, and thus give a false characteristic.

Where lights have different colored sectors, be guided by the correct bearing of the light; do not rely on being able to accurately observe the point at which the color changes. On either side of the line of demarcation of colored sectors there is always a small arc of uncertain color.

Arcs drawn on charts around a light show the bearings between which the variation of visibility or obscuration occurs and do not indicate the distance at which it can be seen. On some bearings the distance may be reduced or increased by land or other obstructions, depending on the distance from the light.

Lights should not be passed close aboard because in many cases rip-rap mounds are maintained to protect the structures against ice damage and scouring action.

Fog signals.—Caution should be exercised in the use of sound fog signals for navigation purposes. They should be considered solely as warning devices.

Sound travels through the air in a variable manner with or without the effects of wind and, therefore, the hearing of fog signals cannot be implicitly relied upon. Experience indicates that distances must not be judged only by the intensity of the sound; that occasionally there may be areas close to a fog signal in which it is not heard; and that fog may exist not far from a station, yet not be seen from it, so the signal may not be operating. It is not always possible to start a fog signal immediately when fog is observed.

Lightships.—Courses should invariably be set to pass lightships with sufficient clearance to avoid the possibility of collision from errors of observation, current and wind effects, other vessels in the vicinity, defect in steering apparatus, and from other causes. Experience shows that lightships cannot be safely used as leading marks to be passed close aboard, but should always be left broad off the course, whenever searoom permits.

During extremely heavy weather and due to their exposed locations, lightships may be carried off station without the knowledge and despite the best efforts of their crews. A lightship known to be off station will secure her light, fog signal, and radiobeacon and fly the International Code signal "PC" signifying "Lightship is not at anchor on her station."

Station (watch) buoys are sometimes moored near lightships to mark the approximate station should the lightship be carried away or temporarily removed. Since these buoys are always unlighted and, in some cases, moored as much as a mile from the lightship, the danger of a closely-passing vessel colliding with them is always present, particularly so during darkness or periods of reduced visibility.

Buoys.—The navigator should check the position by shore bearings, soundings, or other means, and not rely entirely on a buoy being on its charted position and showing its proper characteristic. Buoys are liable to be carried away, shifted, capsized, or sunk as a result of storms, ice conditions, collision, or other accident. Lighted buoys may become extinguished or show improper characteris-

tics, or sound buoys may not function because of storm, ice, or collision.

Buoys may not always properly mark shoals or other obstructions due to shifting shoals and storms. Buoys marking wrecks or other obstructions are usually placed on the seaward or channelward side and not directly over a wreck. Since buoys may be located some distance from a wreck they are intended to mark because of local conditions, and since sunken wrecks are not always static, extreme caution should be exercised when operating in the vicinity of such buoys.

Radiobeacons.—A list and descriptive details of all marine radiobeacons are given in the Light Lists. There is included in these publications the procedure to follow for the use of radiobeacons for calibration of radio direction-finders as well as a list of special radio direction-finder calibration stations.

A vessel steering a course for a radiobeacon should observe the same precautions as when steering for a light or any other mark. If the radiobeacon is aboard a lightship, particular care should be exercised to avoid the possibility of collision, and sole reliance should never be placed on sighting the lightship or hearing its fog signal. If there are no dependable means by which the vessel's position may be fixed and the course changed well before reaching the lightship, a course should be selected that will insure passing the lightship at a distance, rather than close aboard, and repeated bearings of the radiobeacon should show an increasing change in the same direction.

Radio bearings.—No exact data can be given as to the accuracy to be expected in radio bearings taken by a ship, since the accuracy depends to a large extent upon the skill of the ship's operator, the condition of the ship's equipment, and the accuracy of the ship's calibration curve. Mariners are urged to obtain this information for themselves by taking frequent radio bearings, when their ship's position is accurately known, and recording the results. Bearings of aircraft ranges and standard broadcast stations should be used with particular caution due to coastal refraction and lack of calibration of their frequencies.

Conversion of radio bearings to Mercator bearings.—The increasing use of radio directional bearings for locations of ships' positions at sea, especially during foggy weather, has made it particularly desirable to be able to apply these radio bearings directly to the nautical chart. These radio bearings are the bearings of the great circles passing through the radio stations and the ship, and, unless in the plane of the Equator or a meridian, would be represented on a Mercator chart as curved lines. Obviously it is impracticable for a navigator to plot such lines on a Mercator chart, so it is necessary to apply a correction to a radio bearing to convert it into a Mercator bearing, that is, the bearing of a straight line on a Mercator chart laid off from the sending station and passing through the receiving station.

A table of corrections is given in the Appendix for the conversion of a radio bearing into a Mercator bearing. It is sufficiently accurate for practical purposes for distances up to 1,000 miles.

The only data required are the latitudes and longitudes of the radiobeacons and of the ship by dead reckoning. The latter is scaled from the chart, and the former is either scaled from the chart or taken from the list of radiobeacons in the Light List.

The table is entered with the differences of longitude in degrees between the ship and station (the nearest tabulated value being used), and opposite the middle latitude between the ship and station, the correction to be applied is read.

The sign of the correction (bearings read clockwise from the north) will be as follows: In north latitude, the minus sign is used when the ship is east of the radiobeacon and the plus sign used when the ship is west of the radiobeacon. In south latitude, the plus sign is used when the ship is east of the radiobeacon, and the minus sign is used when the ship is west of the radiobeacon.

To facilitate plotting, 180 degrees should be added to or subtracted from the corrected bearing, and the result plotted from the radiobeacon.

Should the position by dead reckoning differ greatly from the true position of the ship as determined by plotting the corrected bearings, retrial should be made, using the new value as the position of the ship.

Radio bearings from other vessels.—Any vessel with a radio direction-finder can take a bearing on a vessel equipped with a radio transmitter. These bearings, however, should be used only as a check, as comparatively large errors may be introduced by local conditions surrounding the radio direction-finder unless known and accounted for. Although any radio station, for which an accurate position is definitely known, may serve as a radiobeacon for vessels equipped with a radio direction-finder, extreme caution must be exercised in their use. Stations established especially for maritime services are more reliable.

Loran.—A list of stations and descriptive details of the Loran System are given in the Light Lists. Instructions, tables, and charts of the Loran System are published by the Naval Oceanographic Office. The Coast and Geodetic Survey shows Loran lines on general charts of United States coasts.

Exact data cannot be given as to the accuracy to be expected in Loran positions since the accuracy depends to a large extent on the skill of the operator, the condition and type of receiving equipment, and the area of operation. The accuracy of a Loran fix is determined by the accuracy of the individual lines of position used to establish the fix and by their angle of intersection.

Loran position determinations on or near the baseline extensions are subject to geometric errors exceeding two nautical miles per microsecond and, therefore, should be avoided whenever possible. Loran is a long range aid to navigation and should not normally be used in pilot waters. The use of skywaves is not recommended within 250 miles of either station.

Caution must be used in matching Loran signals to insure that the ground wave signal of one station is not unknowingly matched with a skywave signal of the other station of the pair, or a one-hop skywave signal from station with a two-hop skywave signal from the other.

Numbering and recording of undocumented vessels.—Certain undocumented vessels are required to be numbered by the Federal Boating Act of 1958, effective April 1, 1960. They may be numbered either by the Coast Guard or by a state having an approved numbering system. Owners may obtain the necessary information from any Coast Guard District Commander.

Licensing of vessels.—Navigation laws pertaining to registry, enrollment, and licensing of vessels are administered by the **Bureau of Customs.** The bureau's functions also include issuing of commissions to yachts and the assignment of signal letters; the measurement of vessels, administration of tonnage duties, and the collection of tolls; the regulation of vessels in the coasting and fishing trade and limitation of the use of foreign vessels in waters under the jurisdiction of the United States; the recording of sales, conveyances, and mortgages of vessels; the protection of steerage passengers, and the remission of fines, penalties, and forfeitures incurred under the laws governing these matters. Collection districts and ports of entry located within the area covered by this Coast Pilot are tabulated in the Appendix.

Danger signal.—It is stated in the **Pilot Rules for Inland Waters,** § 80.1, if, when steam vessels are approaching each other, either vessel fails to understand the course or intention of the other, from any cause, the vessel so in doubt shall immediately signify the same by giving several short and rapid blasts, not less than four, of the steam whistle, the danger signal. Article 18, Rule III, of the **Inland Rules of the Road** also contains this provision. **The International Rules of the Road,** Part D, Rule 28(b), states, in part, that, whenever a power-driven vessel which, under these Rules, is to keep her course and speed, is in sight of another vessel and is in doubt whether sufficient action is being taken by the other vessel to avert collision, she may indicate such doubt by giving at least five short and rapid blasts on the whistle.

Minesweeper signals.—United States vessels engaged in minesweeping operations have their maneuvering powers considerably hampered. All other vessels, whether steamers or sailing craft, should keep out of the way of the sweepers, remembering especially that it is dangerous to pass between the vessels of a pair or group sweeping together.

All vessels towing sweeps are to show a black ball at the foremasthead, and at the yardarm on the side or sides on which it is dangerous to pass, **by day** and green lights instead of the black balls **by night;** the lights may only be exhibited when necessary to warn approaching friendly vessels. Other vessels are not to approach the sweepers nearer than 500 yards on either beam or 1,000 yards astern; under no circumstances is a vessel to pass through a formation of mine sweepers. The sweepers should be prepared to warn other vessels who persist in approaching too close by means of any of the appropriate signals from the International Code of Signals.

Improper use of searchlights prohibited.—No person shall flash or cause to be flashed the rays of a searchlight or other blinding light onto the bridge or into the pilothouse of any vessel under way (46 CFR 78.27-1(a). The International Code Signal "ZO" may be made by a vessel inconvenienced by the glare of a searchlight in order to apprise the offending vessel of the fact.

Unnecessary whistling prohibited.—The unnecessary sounding of the vessel's whistle is prohibited within any harbor limits of the United States (46 CFR 78.23-1(a)).

Search and rescue operations.—The Coast Guard coordinates search and rescue operations in the cases of surface vessels or aircraft that are in distress or overdue. Search and rescue planes have special markings consisting of a wide band of fluorescent red orange around the after part of the fuselage or hull. The cooperation of vessel operators with search and rescue planes may mean the difference between life and death for some seaman or aviator.

Operators of disabled wooden craft and persons adrift in rubber rafts or boats that are, or may consider themselves to be, the object of a search, should hoist on a halyard or otherwise place aloft as high as possible any metallic object that would assist their detection by radar. Coast Guard cutters and aircraft are radar equipped and thus are able to continue searching in darkness and during other periods of low visibility.

Aircraft procedures for directing surface craft to scene of distress incident.—The following procedures performed in sequence by an aircraft mean that the aircraft is directing a surface craft toward the scene of a distress incident:

(a) Circling the surface craft at least once.

(b) Crossing the projected course of the surface craft close ahead at low altitude, opening and closing the throttle, or changing the propeller pitch.

(c) Heading in the direction in which the surface craft is to be directed. The surface craft should acknowledge the signal by changing course and following the aircraft. If, for any reason, it is impossible to follow, the surface craft should hoist the international code flag NOVEMBER, or use any other signaling means available to indicate this.

The following procedures performed by an aircraft mean that the assistance of the surface craft is no longer required:

(a) Crossing the wake of the surface craft close astern at a low altitude opening and closing the throttle or changing the propeller pitch.

Note.—The above procedures are taken from the convention on International Civil Aviation.

Merchant vessel procedures for assisting an aircraft that must ditch.—The following are recommended procedures for assisting an aircraft that desires to ditch alongside:

By day: 1. Establish a radiotelephone watch on 2182 kcs if equipped. Attempt to contact the aircraft on this frequency.

2. Maintain a radiotelegraphy watch on 500 kcs. The Rescue Coordination Center controlling the case will try to contact the ship on this frequency via a shore radio station. Communications with the aircraft may have to be relayed in this manner.

3. Be prepared to send homing signals for the aircraft on 410 kcs.

4. Provide black smoke if possible to aid aircraft in sighting the ship.

5. Post extra lookouts.

6. Prepare to stop vessel or proceed towards plane according to circumstances.

7. Have two lifeboats and lifeboat crews ready. Include in each lifeboat two ring buoys with buoyant heaving lines, and fire extinguishers.

8. Have medicine chest, stretchers, blankets, hot drinks and food ready.

9. Have ship's hospital prepared to receive injured persons.

10. Rig Jacobs ladders. Rig cargo net or rope mail sling on lee side amidships by cargo boom, to be used if necessary to heave up exhausted survivors. Injured persons should be left in the lifeboat to be hoisted aboard with it.

11. Be prepared to give aircraft information on weather and sea conditions. Aircraft will want to know wind direction and force; direction, height, and length of primary and secondary swell systems. If pilot selects ditch heading in sufficient time and conditions otherwise permit, lay foam path along ditching course.

12. When aircraft is in sight set course parallel to ditch heading that pilot has chosen. If not in communication with the aircraft by the time the plane is sighted and unable to obtain pilot's ditch heading, set course parallel to the main swell system and into the wind component, if any.

13. If on board, use a liferaft or buoyant apparatus in water as a landing platform at the Jacobs ladder.

14. Instruct coxswains to recover those survivors in the water or clinging to wreckage before recovering those in liferafts.

15. Keep the Rescue Coordination Center advised by radio, prior to, and subsequent to ditching.

By night.—In addition to procedures recommended for daytime, the following are also recommended if the emergency occurs at night:

1. Lay a string of not less than 6 ring buoys with water lights approximately 500 feet apart in a single line along the ditch heading received from the pilot. Take station two-thirds down the lighted lane off to one side. The aircraft will attempt to land close to the lighted lane. Do not use carbide water lights because of the danger of gasoline on the water.

2. Light up the ship with all fixed deck lights and rig cargo lights on masts, king posts, top of decks, etc., if possible.

3. Use searchlights as visual beacons, shining one vertically and sweeping the sky at 15° off the horizon with the other. Do not shine lights toward the aircraft at any time, since this would blind the pilot.

Ships in distress.—Radio-equipped vessels requiring assistance may obtain the services of the Coast Guard by transmitting a request on the international distress and calling frequency 500 kc. to "Any Coast Guard Unit" (radio call NCU), or to any shore radio station addressed to "COGARD." Shore radio stations will forward to the Coast Guard all information regarding vessels requiring assistance unless such information is contained in a message specifically addressed elsewhere.

If the following information is included in the original request for assistance it will place the responsible Coast Guard officer in a position to determine immediately the types and numbers of vessels and aircraft required to render adequate aid, thus greatly facilitating the work of the Coast Guard and avoiding any unnecessary delay in the dispatching of assistance:

1. Name, type, and nationality of vessel; color, size and shape.
2. Position, course, and speed (including drift).
3. Nature of trouble and condition of vessel, sea and wind. Action taken, if any.
4. Number of persons on board.
5. State whether or not Coast Guard assistance is required.

Small craft in distress.—Under the provision of the international regulations, which permits the use of any means available to a vessel or aircraft in distress to draw attention and obtain help, small commercial and private craft equipped with radiotelegraph or radiotelephone apparatus that cannot be operated on the international distress frequency of 500 kc. (600 m.) may usually obtain Coast Guard assistance by transmitting the distress signal or call and the message on the 2182 kc. frequency.

Submarine emergency identification signals.—The following smoke-bomb or flare signals are made by submarines of the United States in cases of necessity:

Green indicates torpedo has been fired; will be used to simulate torpedo firing on special exercises such as convoy exercises.

Yellow indicates that submarine is about to come to periscope depth from below periscope depth. Surface craft terminate antisubmarine counterattacks and clear vicinity of submarine. Do not stop propellers!

Red indicates an emergency condition within the submarine and she will surface immediately if possible. Surface vessels clear the area and stand by to give assistance after the submarine has surfaced. In case of repeated red signals, or if the submarine fails to surface within a reasonable time, she may be assumed to be disabled. Buoy the location, look for submarine marker buoy, and attempt to establish sonar communications. Advise naval authorities.

The foregoing, all of which mark the submarine's position, are fired from a submerged signal ejector into the air to a height of about 300 feet, then float downward slowly, suspended from a small parachute, and give colored illuminataion for about 30 seconds.

Submarines are also equipped with messenger buoys which are about 3 feet in diameter and are painted international orange. A submarine on the bottom in distress and unable to surface, will, if possible, release this buoy. An object of this description which is sighted on the surface of the water should be investigated and naval authorities advised.

The **CORPS OF ENGINEERS**, U.S. Army, has charge of the improvement of the rivers and harbors of the United States and of miscellaneous other civil works which include the administration of the Federal laws enacted for the protection and preservation of navigable waters of the United States, the establishment of regulations for the use, administration, and navigation of navigable waters, the approval of plans of bridges, the alteration of obstructive bridges, the establishment of anchorage grounds and harbor lines, the removal of sunken vessels obstructing or endangering navigation, and the granting of permits for structures or operations in navigable waters.

Information concerning the various ports, improvements, channel depths, navigable waters, and the condition of the Intracoastal Waterways in the areas under their jurisdiction may be obtained direct from the District Engineer offices; see Appendix.

Anchorage areas and restricted areas in most places are defined and regulations governing them are established by the Corps of Engineers. The regulations are enforced by the U.S. Coast Guard, and the areas are shown on the large-scale charts of the Coast and Geodetic Survey. Copies of the regulations may be obtained at the offices of the Corps of Engineers. The regulations also are copied into the appropriate Coast Pilots.

Fishtraps.—The Corps of Engineers has general supervision of location, construction, and manner of maintenance of all traps, weirs, pounds, or other fishing structures in the navigable waters of the United States. Construction permits issued by the Engineers specify the lights and signals required for safety of navigation.

Fish havens.—This is nautical-chart terminology for the artificial fishing reefs established (through 1962) in United States coastal waters to simulate the legitimate reefs and wrecks that attract fish. The Corps of Engineers issues permits to various interests, usually sport fishermen, to dump assorted junk ranging from old trolley cars to scrap building material in specified areas which may be of very small extent or may stretch many miles along a depth contour; old automobile bodies appear to be the favorite material of the reef builders. These underwater junk piles may rise only a few feet or as much as 10 feet (according to permit) above natural bottom, but the reef-builder's adherence to permit specifications can only be checked with a wire drag. Navigators should be cautious about passing over these artificial obstructions or anchoring in their vicinity.

WEATHER BUREAU.—Forecasts and warnings of the approach of storms over land and ocean areas are among the services of the Weather Bureau to navigation, commerce, agriculture, and the general public. Other warnings cover cold waves, frost, forest-fire hazard, and floods.

Meteorological information is collected and transmitted at 1-hour, 3-hour, and 6-hour intervals from land stations, ships at sea, and aircraft. These reports form a basis for the forecasting service, for summarization and publication of climatological data having general value and applicability, and for research basic to improvement of the national weather service.

Weather Bureau offices are located in many ports and other places throughout the continental United States and possessions. Stations in the area of concern to this Coast Pilot, at which the public may compare barometers against Weather Bureau barometers and discuss matters of weather service with Weather Bureau officials, are listed in the Appendix. By international agreement, the Weather Bureau also bears a share in the maintenance and operation of certain weather ships on the free oceans.

Marine meteorological service.—The collection of observations from ships at sea is conducted on a purely voluntary and cooperative basis. The Weather Bureau supplies shipmasters with blank forms, printed instructions, and such other material as is essential to the making and recording of observations. In the course of an average peacetime year, more than 400,000 observations are received from vessels representing every maritime nation and reaching every quarter of the globe.

The **hurricane and storm warning service** was established primarily to aid marine interests. Storm warnings are prepared at regular district forecast centers and at special hurricane forecast centers. The warnings are distributed to the public through all neighboring Weather Bureau offices by radio, the press, and every other available means. During the West Indian hurricane season, June to November, inclusive, teletype circuits expedite the exchange of reports from the Atlantic and Gulf coasts; special reports are obtained from weather reconnaissance planes which fly near the storms and sometimes into the storm centers.

Hurricane watch.—An announcement is issued by the Weather Bureau to the public and all other interests via press, radio, and television whenever a tropical storm or hurricane becomes a threat to a coastal area. The "hurricane watch" announcement is not a warning; it indicates that the hurricane is near enough that everyone in the "watch" area should listen for subsequent advisories and be ready to take precautionary action in case hurricane warnings are issued.

Storm warning displays.—The Weather Bureau employs the following system for displaying warning signals at stations along United States coasts, except Alaska, but including the Great Lakes and Puerto Rico, when winds dangerous to navigation are forecast.

Small-craft warning: One red pennant displayed by day and a red light above a white light at night to indicate that winds up to 33 knots and/or sea conditions dangerous to small craft operations are forecast for the area.

Gale warning: Two red pennants displayed by day and a white light above a red light at night to indicate that winds ranging from 34 to 47 knots are forecast for the area.

Whole gale warning: A single square red flag with black center displayed by day and two red lights at night to indicate that winds ranging from 48 to 63 knots are forecast for the area.

Hurricane warning: Two square red flags with black

centers displayed by day and a white light between two red lights at night to indicate that winds of 64 knots and above are forecast for the area.

The **NAVAL OCEANOGRAPHIC OFFICE** is required to provide accurate nautical charts and related information for foreign waters. Publications include Sailing Directions (pilots), Light Lists, Table of Distances, Radio Navigational Aids, Radio Weather Aids, International Code of Signals, and the American Pratical Navigator (Bowditch). The weekly Notice to Mariners, a joint arrangement with the Coast Guard, contains corrections to charts and publications for both foreign and domestic waters; see Appendix for coverage.

The **IMMIGRATION AND NATURALIZATION SERVICE** administers the laws relating to admission, exclusion, and deportation of aliens, the registration and fingerprinting of aliens, and the naturalization of aliens lawfully resident in the United States.

The designated ports of entry for aliens are divided into three classes. Class A is for all aliens. Class B is only for aliens who at the time of applying for admission are lawfully in possession of valid resident aliens' border-crossing identification cards or valid non-resident aliens' border-crossing identification cards or are admissable without documents under the documentary waivers contained in 8 CFR 212.1(a). Class C is only for aliens who are arriving in the United States as crewmen as that term is defined in Section 101(a)(10) of the Immigration and Nationality Act. [The term "crewman" means a person serving in any capacity on board a vessel or aircraft.] No alien may enter the United States until he has been inspected by an immigration officer. A list of the ports of entry for aliens is given in the Appendix.

The **PUBLIC HEALTH SERVICE** administers hospitalization and outpatient treatment to legal beneficiaries of the Government; it also administers foreign and domestic quarantine laws and conducts medical examinations of aliens.

Quarantine.—A vessel arriving at a port under the control of the United States shall undergo quarantine inspection prior to entry unless exempted from such inspection by section 71.46 or 71.47 of Foreign Quarantine Regulations (42 CFR Part 71), and Supplemental Provisions, of the Public Health Service, Department of Health, Education, and Welfare.

Vessels subject to quarantine inspection shall upon arrival at ports under the control of the United States fly a yellow flag, and await inspection, as provided in section 71.62 of Foreign Quarantine Regulations. Only the pilot shall board or be permitted to board any vessel subject to quarantine inspection until after it has been inspected by the quarantine officer and granted pratique, except with the permission of the quarantine officer. A person boarding such vessel shall be subject to the same restrictions as those imposed on the persons on the vessel. No person shall leave or be permitted to leave any vesel subject to quarantine inspection until after it has been inspected by the quarantine officer and granted pratique, except with the permission of the quarantine officer.

Sanitary inspection.—Vessels arriving at a port under the control of the United States from a foreign port shall be subject to sanitary inspection to ascertain whether there exists rodent, insect, or other vermin infestation, contaminated food or water, or other insanitary condition requiring measures for the prevention of the introduction, transmission, or spread of communicable disease.

National quarantine regulations will be found at the stations of the Public Health Service and at United States consulates and will be furnished to vessels upon application to officers of the Service or to Chief, Division of Foreign Quarantine, Public Health Service, DHEW, Washington, D.C., 20201.

Medical service.—United States merchant seamen are entitled to medical relief obtainable through the Public Health Service. A United States seaman is one engaged on board in care, preservation, or navigation of any registered, enrolled, or licensed vessel of the United States, or in the service, on board, of those so engaged. Hospitals, outpatient clinics, and outpatient offices of the Public Health Service are located at the addresses given in the Appendix. Free medical advice is furnished to seamen by radio.

RADIO.—The Federal Communications Commission controls radio communications in the United States and in all possessions except the Panama Canal Zone. Commission inspectors have authority to board ships to determine whether their radio stations comply with international treaties, Federal laws and Commission regulations. The Commission has field offices in the principal United States ports. Information concerning ship radio regulations and service documents may be obtained from the Federal Communications Commission, Washington, D.C., 20554, or from any of the field offices.

Marine weather broadcasts.—Information on weather over North Atlantic and North Pacific waters is issued by the Weather Bureau for broadcast by commercial and Government radio stations. Marine bulletins for the western North Atlantic are broadcast by Navy station NSS, Washington, D.C.; those for the eastern North Pacific are transmitted by KPH, Bolinas, Calif., and KTK, San Francisco, Calif. A separate bulletin for Central Pacific waters is broadcast by KHK, Kahuku, Hawaii. The marine bulletins include storm advisories, forecasts, and coded weather-map analyses and reports. Station frequencies, broadcast times, and areas affected are stated in the radio publications; see Appendix.

Advisories and forecasts also are broadcast by Navy stations NBA, Balboa, C.Z.; NPG, San Francisco, Calif.; NHB, Kodiak, Alaska; and NPM, Honolulu, Hawaii.

Local weather bulletins, containing coastal-area forecasts, storm advisories, and weather summaries for specific areas, are broadcast on regular schedules by many Government and commercial radio stations.

Emergency broadcasts by Navy radio stations.—Storm advisories and notices concerning the safety of navigation at sea are broadcast by Navy radio stations in accordance with the degree of urgency, as follows:

A. Notices of tidal waves, hurricanes, typhoons, and cyclones so imminent as to warrant immediate broadcasting: (1) One transmission immediately on receipt; (2) one transmission at the end of the first ensuing silent period; and (3) one transmission during the first ensuing on-watch period for ships with one operator, in case both previous transmissions were made during the off-watch period.

B. Storm warnings and notices of less urgency than those specified in (A) and other than those normally included in scheduled hydrographic broadcasts: (1) One transmission at the end of the first ensuing silent period; and (2) one transmission during the on-watch period for ships with one operator in case the previous transmission was made during an off-watch period.

These broadcasts are preceded by transmission of the Urgent Signal (XXX) or the Safety Signal (TTT) and a preliminary announcement on 500 kc. of the message to follow on the station working frequency.

Emergency broadcasts by Coast Guard radio stations.—Storm and hurricane warnings, advisories and other urgent marine information are broadcast by Coast Guard radio stations:

A. By radiotelegraph on the station's medium frequency immediately following the first silent period after receipt of the message at the radio station (HH+18 or HH+48) preceded by an initial call on 500 kc. These safety broadcasts are preceded by the Safety Signal (TTT). Whenever this transmission occurs outside the watch hours for single radio operator ships, the message will be repeated at the end of the next silent period falling within the radio watch hours for such vessels. If a station makes daily broadcasts of marine information, the message will also be included in its next scheduled transmission.

B. By radiotelephone on 2182 kc. immediately following receipt of the message at the radio station and repeated at the station's next scheduled broadcast.

Radiotelephone broadcasts of weather information (United States).—Transmission by voice of weather information from the Weather Bureau is made through certain radio stations of the Coast Guard and of the commercial coastal radiotelephone service. These broadcasts are followed immediately by reports of dangerous obstructions and changes in aids to navigation.

This service gives to yachts, fishing craft, tugboats, and other vessels equipped with a radio receiving set having a band covering the frequency range of 2 to 3 megacycles, official weather information from the Weather Bureau in plain language and on regular schedules.

These radiotelephone broadcasts are made twice and, in some cases, four times daily at definite times and include marine forecasts, and storm warnings whenever they are issued, for coastal waters in or adjacent to the areas served by the radio stations.

Certain local radio stations in the standard broadcast band have microphones installed in nearby Weather Bureau offices. From these stations forecasts, weather summaries, and warnings are broadcast on regular schedule. For stations and schedules in the area covered by this volume, see the Appendix.

West Indies.—Coast Guard station NMR, San Juan, P.R., broadcasts twice daily by radiotelephone and radiotelegraph a weather bulletin consisting of marine forecasts and weather summary for the Caribbean Sea area and small-craft, storm, and hurricane warnings when applicable.

Mexico and Canada.—Scheduled broadcasts of weather information affecting the coasts of Mexico and Canada are made by designated stations of those countries on marine frequencies by both radiotelegraph and radiotelephone.

Reports from ships.—The master of every ship of the United States equipped with radio transmitting apparatus, on meeting with a tropical storm, dangerous ice, subfreezing air temperatures with gale force winds causing severe ice accretion on superstructures, derelict, or any other direct danger to navigation, is required to cause to be transmitted a report of these dangers to ships in the vicinity and to the appropriate Government agencies.

During the West Indies hurricane season, June 1 to November 30, ships in the Gulf of Mexico, Caribbean Sea area, southern North Atlantic Ocean, and the Pacific waters west of Central America and Mexico are urged to cooperate with the Weather Bureau in furnishing these special reports in order that warnings to shipping and coastal areas may be issued.

TIME SIGNALS.—The United States system of broadcasting time signals begins at 55 minutes 0 second of some hour and continues for 5 minutes. Signals are transmitted on every second of this period except the 29th of each minute, the 51st of the first minute, the 52d of the second minute, the 53d of the third minute, the 54th of the fourth minute, the last 4 seconds of the first 4 minutes, and the last 9 seconds of the last minute. The hour signal is a 1.3-second dash, which is much longer than the others.

In all cases the beginnings of the dashes indicate the beginnings of the seconds, and the ends of the dashes are without significance. The number of dashes sounded in the group at the end of any minute indicates the number of minutes of the signal yet to be sent. In case of signal failure or error, the signal is repeated 1 hour later.

The National Bureau of Standards broadcasts time signals from its radio station **WWV** near Washington, D.C., on radio frequencies of 2.5, 5, 10, 15, 20, and 25 megacycles, which are on the air at all times, day and night. This insures reliable coverage of the United States and extensive coverage of other parts of the world. The services include time announcements, standard time intervals, standard audio frequencies, and radio-propagation disturbance-warning notices.

Time announcements.—The audio frequencies are interrupted at precisely 2 minutes before each hour. They

are resumed precisely on the hour and each 5 minutes thereafter. The beginnings of the periods, when the audio frequencies are resumed, are in agreement with the basic service of the U.S. Naval Observatory, and accordingly they accurately mark the hour and successive 5-minute periods.

Greenwich Mean Time is announced in telegraphic code each 5 minutes. The zero- to 24-hour system is used. This announcement refers to the end of the announcement interval. A voice announcement of eastern standard time is given following each telegraphic code announcement.

Standard time intervals.—On each carrier frequency is a pulse which occurs at intervals of precisely 1 second. The pulse is omitted at the beginning of the last second of every minute. The 1-minute, 4-minute, and 5-minute intervals, synchronized with the second pulses, are marked by the beginning or ending of the periods when the audio frequencies are off.

A radio-propagation disturbance warning forecast is transmitted in Morse code twice each hour at 19½ and 49½ minutes past the hour. These warnings tell users of radio transmission paths over the North Atlantic, the condition of the ionosphere at the time of the announcement, and how good or bad communication conditions are expected to be for the next 12 hours. During a period of radio-propagation disturbance, direction-finder observations may be unreliable; the letters "N", "U", and "W" signify that radio propagation conditions are, respectively, normal, unsettled, or disturbed.

Radio station **WWVH**, on the island of Maui, Hawaii, broadcasts on 5, 10, and 15 megacycles. The schedule of broadcasts is the same as that of station WWV for standard time intervals, time announcements in code, standard audio frequencies, and accuracy. Simultaneous reception of WWV and WWVH does not interfere with ordinary use of the standard frequency and time signals.

The WWVH broadcast is interrupted for 4 minutes following each hour and half hour and for periods of 34 minutes each day beginning at 1900 GMT.

DESTRUCTIVE WAVES.—Unusual sudden changes in water level can be caused by seismic sea waves or violent storms. These two types of destructive waves have become commonly known as **tidal waves**, a name which is technically incorrect as they are not the result of tide-producing forces.

Seismic sea waves are set up by submarine earthquakes. Many such seismic disturbances do not produce sea waves and often those produced are small, but the occasional large waves can be very damaging to shore installations and dangerous to ships in harbors.

These waves travel great distances and can cause tremendous damage on coasts far from their source. The wave of April 1, 1946, which originated in the Aleutian Trench, demolished nearby Scotch Cap Lighthouse and caused damages of $25 million in the Hawaiian Islands, 2,000 miles away. The wave of May 22–23, 1960, which originated off southern Chile, caused widespread death and destruction in islands and countries throughout the Pacific.

The speed of seismic sea waves varies with the depth of the water, reaching 300 to 500 knots in the deep water of the open ocean. In the open sea they cannot be detected from a ship or from the air because their length is so great, sometimes a hundred miles, as compared to their height, which is usually only a few feet. Only on certain types of shelving coasts do they build up into waves of disastrous proportions.

There is usually a series of waves with crests 10 to 40 minutes apart, and the highest may occur several hours after the first wave. Sometimes the first noticeable part of the wave is the trough which causes a recession of the water from shore, and people who have gone out to investigate this unusual exposure of the beach have been engulfed by the oncoming crest. Such an unexplained withdrawal of the sea should be considered as nature's warning of an approaching wave.

Improvements have been made in the quick determination and reporting of earthquake epicenters, but no method has yet been perfected for determining whether a sea wave will result from a given earthquake. The Honolulu Observatory of the Coast and Geodetic Survey is headquarters of a warning system which has field reporting stations (seismic and tidal) in most countries around the Pacific. When a warning is broadcast, waterfront areas should be vacated for higher ground, and ships in the vicinity of land should head for the deep water of the open sea.

Storm waves.—A considerable rise or fall in the level of the sea along a particular coast may result from strong winds and a sharp change in barometric pressure. In cases where the water level is raised, higher waves can form with greater depth and the combination can be destructive to low regions, particularly at high stages of tide. Extreme low levels can result in depths which are considerably less than those shown on nautical charts. This type of wave occurs especially in coastal regions bordering on shallow waters which are subject to tropical storms.

Seiche is a stationary vertical wave oscillation with a period varying from a few minutes to an hour or more, but somewhat less than the tidal periods. It is usually attributed to external forces such as strong winds, changes in barometric pressure, swells, or seismic sea waves disturbing the equilibrium of the water surface. Seiche is found both in enclosed bodies of water and superimposed upon the tides of the open ocean. When the external forces cause a short-period horizontal oscillation of the water, it is called **surge**.

The combined effect of seiche and surge sometimes makes it difficult to maintain a ship in its position alongside a pier even though the water may appear to be completely undisturbed, and heavy mooring lines have been parted repeatedly under such conditions. Pilots advise taut lines to reduce the effect of the surge.

691-231 O—63——2

2. NAVIGATION REGULATIONS

THIS chapter contains the sections of **Code of Federal Regulations, Title 33, Navigation and Navigable Waters,** that are of most importance in the areas covered by Coast Pilot 7. The sections are from Part 82, Boundary Lines of Inland Waters; Part 124, Control Over Movement of Vessels; Part 202, Anchorage Regulations; Part 203, Bridge Regulations; Part 204, Danger Zone Regulations; and Part 207, Navigation Regulations.

PART 82—BOUNDARY LINES OF INLAND WATERS:

§ 82.1 General basis and purpose of boundary lines. By virtue of the authority vested in the Commandant of the Coast Guard under section 101 of Reorganization Plan No. 3 of 1946 (3 CFR, 1946 Supp., Ch. IV), and section 2 of the act of February 19, 1895, as amended (28 Stat. 672, 33 U.S.C. 151), the regulations in this part are prescribed to establish the lines dividing the high seas from rivers, harbors, and inland waters in accordance with the intent of the statute and to obtain its correct and uniform administration. The waters inshore of the lines described in this part are "inland waters," and upon them the inland rules and pilot rules made in pursuance thereof apply. The waters outside of the lines described in this part are the high seas and upon them the international rules apply. The regulations in this part do not apply to the Great Lakes or their connecting and tributary waters.

§ 82.2 General rules for inland waters. At all buoyed entrances from seaward to bays, sounds, rivers, or other estuaries for which specific lines are not described in this part, the waters inshore of a line approximately parallel with the general trend of the shore, drawn through the outermost buoy or other aid to navigation of any system of aids, are inland waters, and upon them the inland rules and pilot rules made in pursuance thereof apply, except that Pilot Rules for Western Rivers apply to the Red River of the North, the Mississippi River and its tributaries above Huey P. Long Bridge, and that part of the Atchafalaya River above its junction with the Plaquemine-Morgan City alternate waterway.

§ 82.120 Juan de Fuca Strait, Wash., and Puget Sound. A line drawn from the northernmost point of Angeles Point to Hein Bank Lighted Bell Buoy; thence to Lime Kiln Light; thence to Kellett Bluff Light; thence to Turn Point Light on Stuart Island; thence to westernmost extremity of Skipjack Island; thence to Patos Island Light; thence to Point Roberts Light.

§ 82.125 Columbia River Entrance. A line drawn from the west end of the north jetty (above water) to South Jetty Bell Buoy 2SJ.

§ 82.127 Crescent City Harbor. A line drawn from Crescent City Outer Breakwater to the highest point in the center of Whaler Island.

§ 82.129 Arcata—Humboldt Bay. A line drawn from the outer end of Humboldt Bay North Jetty to the outer end of Humboldt Bay South Jetty.

§ 82.131 Bodega and Tomales Bays. A line drawn the northwestern tip of Tomales Point to Tomales Point Lighted Whistle Buoy 2; thence to Bodega Rock Channel Lighted Gong Buoy 2; thence to the southernmost extremity of Bodega Head.

§ 82.133 San Francisco Harbor. A straight line from Point Bonita Light drawn through Mile Rocks Light to the shore.

§ 82.135 Santa Cruz Harbor. A line drawn from Santa Cruz Light to the southernmost projection of Soquel Point.

§ 82.137 Moss Landing Harbor. A line drawn from the west end of Moss Landing Harbor North Breakwater to the west end of the pier located 0.3 mile to the south of Moss Landing Harbor North Breakwater.

§ 82.139 Monterey Harbor. A line drawn from Monterey Harbor Breakwater Light to Monterey Harbor

Anchorage Buoy B; thence to Monterey Harbor Anchorage Buoy A; thence to the north end of Monterey Municipal Pier 2.

§ 82.141 Estero—Morro Bay. A line drawn from the outer end of Morro Bay Entrance East Jetty to Morro Bay Entrance Lighted Bell Buoy 1; thence to Morro Bay Light.

§ 82.143 San Luis Obispo Bay. A line drawn from the outer end of Whaler Island Breakwater to the southernmost tip of Fossil Point.

§ 82.145 San Pedro Bay. A line drawn from Los Angeles Harbor Light through the axis of the Middle Breakwater to the easternmost extremity of the Long Beach Breakwater; thence to Anaheim Bay East Jetty Light 4.

§ 82.147 Santa Barbara Harbor. A line drawn from Santa Barbara Wharf Light to Santa Barbara Lighted Buoy 1; thence to Santa Barbara Harbor Breakwater Light.

§ 82.149 Port Hueneme. A line drawn from Port Hueneme West Jetty Light to the southwest end of Port Hueneme East Jetty.

§ 82.151 Marina del Rey. A line drawn from the southwest end of Marina del Rey North Jetty to the southwest end of Marina del Rey Middle Jetty.

§ 82.153 Redondo Harbor. A line drawn from Redondo Beach East Jetty Light to Redondo Beach West Breakwater Light.

§ 82.155 Newport Bay. A line drawn from Newport East Jetty Light to Newport West Jetty Light.

§ 82.157 San Diego Harbor. A line drawn from the southerly tower of the Coronado Hotel to San Diego Channel Lighted Bell Buoy 5; thence to Point Loma Light.

§ 82.159 Isthmus Cove (Santa Catalina Island). A line drawn from the northernmost point of Lion Head to the north tangent of Bird Rock Island; thence to the northernmost point of Blue Cavern Point.

§ 82.161 Avalon Bay (Santa Catalina Island). A line drawn from White Rock to the northernmost point of Abalone Point.

§ 82.175 Mamala Bay. A line drawn from Barbers Point Light to Diamond Head Light.

PART 124—CONTROL OVER MOVEMENT OF VESSELS:

§ 124.10 Advance notice of vessel's time of arrival to Captain of the Port. (a) The master or agents of every registered vessel of the United States, and every foreign vessel arriving at a United States port or place from a port or place outside the United States, or any such vessel destined from one port or place in the United States to another port or place in the United States, shall give at least 24 hours advance notice of arrival to the Captain of the Port at every port or place where the vessel is to arrive, except as follows:

(1) Registered United States pleasure vessels and registered United States fishing vessels are not required to submit advance notice of arrival report.

(2) When the port of arrival is not located within the geographical area assigned to a particular Captain of the Port, this advance notice of time of arrival shall be made to the Commander of the Coast Guard District in which such port or place is located.

(3) When the arrival is a direct result of the operation of "force majeure," and it is not possible to give at least 24 hours' advance notice of time of arrival, then advance notice as early as practicable shall be furnished.

(4) When the vessel, while in United States waters, does not navigate any portion of the high sea, i.e. does not navigate beyond the low water mark along the coasts or beyond the waters contained within the headlands of the United States.

(5) When a vessel is engaged upon a scheduled route if a copy of the schedule is filed with the Captain of the Port for each port of call named in the schedule and the times of arrival at each such port are adhered to.

(6) When the master of a merchant vessel (except on a coastwise voyage of 24 hours or less) reports in accordance with the U.S. Coast Guard's voluntary Atlantic Merchant Vessel Report (AMVER) System, he shall be considered to be in constructive compliance with the requirements of paragraph (a) of this section and no additional advance notice of vessel's arrival reports to the Captain of the Port is required. The master or agent of a vessel on coastwise voyages of 24 hours or less shall report the advance notice of vessel's arrival to the Captain of the Port at next port of call prior to or upon departure from port.

(7) When a vessel which is engaged in operations in and out of the same port, either on voyages to sea and return without having entered any other port, or on coastwise voyages within the same Coast Guard District, or from ports within the First, Ninth, Thirteenth, or Seventeenth Coast Guard Districts to adjacent Canadian ports, and where no reason exists which renders such action prejudicial to the rights and interests of the United States; the Coast Guard District Commander having jurisdiction may prescribe conditions under which Coast Guard Captains of the Ports may consider such a vessel as being in constructive compliance with the requirements of this section without the necessity for reporting each individual arrival.

(8) A westbound vessel which is to proceed to or through United States waters of the St. Lawrence River and/or the Great Lakes shall be subject to compliance with paragraph (b) of this section.

(b) The master or agent of every vessel other than

vessels of United States or Canadian nationality engaged in the coastal trade of their respective countries or in trade between their two countries without calling at any other country en route, when proceeding westbound to United States waters of the St. Lawrence River and/or the Great Lakes shall:

(1) At least 24 hours in advance of the vessel's arrival at the Snell Lock, Massena, New York, advise the Commander, Ninth Coast Guard District, Cleveland, Ohio, of estimated time of arrival of such vessel at the Snell Lock.

(2) In addition, prior to or immediately on entering Lake Ontario inbound, advise the Commander, Ninth Coast Guard District, Cleveland, Ohio, of the vessel's first intended United States port of call, if any, and estimated time of arrival at that port.

(3) (Canceled.)

(4) A master of a vessel who reports in accordance with the U.S. Coast Guard's voluntary Atlantic Merchant Vessel Report (AMVER) System and who includes in this report an estimated time of arrival at the Snell Lock, Massena, New York, shall be considered to be in constructive compliance with the requirements of subparagraph (1) of this paragraph and no additional advance notice of vessel's arrival at the Snell Lock is required. Likewise a master of such vessel who indicates in this report the name of the first intended United States port of call and estimated time of arrival at that port shall be considered in constructive compliance with subparagraph (2) of this paragraph and no additional advance notice of arrival is required.

(5) A master or agent of a vessel who files a copy of the scheduled route with the Commander, Ninth Coast Guard District, Cleveland, Ohio, at least 24 hours prior to arrival at Snell Lock, and who includes in the schedule the estimated time of arrival at the Snell Lock, Massena, N.Y., shall be considered to be in constructive compliance with requirements of subparagraph (1) of this paragraph and no additional advance notice of the vessel's arrival at the Snell Lock is required. Likewise, a master or agent of such vessel who indicates in this schedule the name of the first intended United States port of call and estimated time of arrival at that port shall be considered in constructive compliance with subparagraph (2) of this paragraph and no additional advance notice of arrival is required.

(6) When the arrival is a direct result of the operation of "force majeure," and it is not possible to give at least 24 hours advance notice of time of arrival, then advance notice as early as practicable shall be furnished.

§ 124.20 Penalties for violations. Failure to give advance notice will subject the master or agents of a vessel to the penalties of fine and imprisonment, as well as subject the vessel to seizure and forfeiture, as provided in section 2, Title II of the Act of June 15, 1917, as amended, 50 U.S.C. 192. In addition, such failure may result in delay in the movement of the vessel from the harbor entrance to her facility destination within the particular port.

PART 202—ANCHORAGE REGULATIONS:

§ 202.1 General. (a) The areas described in Subpart A of this part are designated as special anchorage areas pursuant to the authority contained in an act amending laws for preventing collisions of vessels approved April 22, 1940 (54 Stat. 150). Section 1 of the act amended Article 11 of the Navigation Rules for Harbors, Rivers, and Inland Waters Generally (33 U.S.C. 180), section 2 amended Rule 9 of the Navigation Rules for Great Lakes and Their Connecting and Tributary Waters (33 U.S.C. 258), and section 3 amended Rule 10 of the Navigation Rules for Red River of the North and Rivers Emptying into Gulf of Mexico and Tributaries (33 U.S.C. 319). Vessels not more than 65 feet in length, when at an anchor in any special anchorage area, shall not be required to carry or exhibit the white anchor lights required by the Navigation Rules.

(b) The anchorage grounds for vessels described in Subpart B of this part are established, and the rules and regulations in relation thereto adopted, pursuant to the authority contained in section 7 of the River and Harbor Act approved March 4, 1915 (38 Stat. 1053; 33 U.S.C. 471).

(c) All bearings in this part are referred to true meridian.

Subpart A—Special Anchorage Areas:

§ 202.90 San Diego Harbor, Calif. (a) Area A-1. All of the Municipal Yacht Harbor within the following described boundaries: Beginning at station 120 on the United States pierhead line; thence along the pierhead line through stations 250A, 258A, 260, 262, 264, 266, 268, 270, and 272A; thence (from station 272A) 226°57′, 2,893.65 feet; thence 191°, 1,118.20 feet: thence 269°28′, 26.83 feet to the point of beginning.

NOTE: This area is reserved for yachts and other recreational craft, and for all types of small craft during storm, stress, or other emergency. Single and fore and aft moorings will be allowed in the area as permitted by the Port Director, Port of San Diego.

(b) Area A-2. An area in the Commercial Basin having the southwesterly side parallel to and 325 feet from the pierhead line and all other sides parallel to and 250 feet from the pierhead line.

NOTE: This area is reserved for commercial fishing boats having a length of 65 feet and under. Single and fore and aft moorings will be allowed in the area as permitted by the Port Director, Port of San Diego.

(c) Area A-3. An area between the United States bulkhead and pierhead lines bounded on the north by a portion of the bulkhead line between Stations 218 and 220; on the northeast by a portion of the bulkhead line between Stations 220 and 222; on the southeast by a line perpendicular to that portion of the bulkhead line between Stations 220 and 222, at a point 1,300 feet southeasterly of Station 220; on the southwest by a portion of the pierhead line between Stations 304 and 306; and on

the west by the easterly side of the nonanchorage area.

NOTE: This area is reserved for commercial fishing boats having a length of 65 feet and under. Single and fore and aft moorings will be allowed in the area as permitted by the Port Director, Port of San Diego.

(d) Area A-5. Shoreward of a line extending from United States Bulkhead Line Station 159 to Station 171.

NOTE: This area is reserved for yachts and other small recreational craft. Fixed moorings will be allowed in the area as permitted by the Port Director, Port of San Diego.

§ 202.95 Newport Bay Harbor, Calif. (a) Area A-1. In Lido Channel, northeast of a line parallel to and 195 feet from the pierhead line along the southwest shore of Lido Isle; north of the south U.S. Bulkhead line off Lido Isle extended; southwest of a line parallel to and 120 feet from the pierhead line along the southwest shore of Lido Isle; and southeast of the north side of Via Barcelona, on Lido Isle, extended.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to the city of Newport Beach Harbor Ordinance No. 543 for recreational and small craft of such size and alignment as permitted by the harbor master.

(b) Area A-2. East of the east side of 15th Street extended; north of a line parallel to and 250 feet from the pierhead line between 14th and 15th Streets, this line being the north line of Newport Channel, and extending east in a straight line to an intersection with a line bearing 268° from the flashing red beacon on the southeast end of Lido Isle, this line being the northwest line of the main fairway; west of the east side of 13th Street extended; and south of a line parallel to and 220 feet from the pierhead line off the south shore of Lido Isle.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to the city of Newport Beach Harbor Ordinance No. 543 for recreational and small craft of such size and alignment as permitted by the harbor master.

(c) Area A-3. A rectangular area, 40 feet wide and 885 feet long, on the west side of Upper Bay Channel, 120 feet east of and parallel to the west pierhead line, the south end being 50 feet north from U.S. Bulkhead Station 130.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to Orange County Harbor Ordinance No. 490 for recreational and small craft of such size and alignment as permitted by the harbor master.

(d) Area A-4. South of a line bearing 268° from the flashing green beacon off Bay Island and passing through the beacon off 13th Street, this line being the south line of the main fairway; north of a line parallel to and 200 feet from the pierhead line off 11th to 8th Streets; and west of a line bearing 203° from the flashing red beacon at the south extremity of Bay Shores, passing through the pierhead line at the east end of Lido Isle.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for recreational and small craft of such size and alignment as permitted by the harbor master.

(e) Area A-5 (Newport Harbor Yacht Club). East of a line bearing 23° from the center of the north end of 8th Street, being parallel to and 150 feet distant from the east end of Area A-4; north of a line parallel to and 200 feet from the pierhead line off 7th and 8th Streets; northwest of a line parallel to and 200 feet from the northwest pierhead line off Bay Island; and south of a line bearing 268° from the flashing green beacon off Bay Island and passing through the beacon off 13th Street, this line being the southerly line of the main fairway.

NOTE: This area is reserved for recreational and other small craft. Single moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for pleasure boats and yachts of such sizes and alignments as permitted by the harbor master.

(f) Area A-6. Northwest of Harbor Island, beginning at a point on the Newport City line 107 feet from the angle point northwest of Harbor Island; thence 36°27′, 55 feet; thence 303°18′, 300 feet; thence 216°27′, 72 feet; thence 165°12′, 211 feet; thence 75°11′44″, approximately 216 feet, to the point of beginning.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to Orange County Harbor Ordinance No. 490 for recreational and small craft of such size and alignment as permitted by the harbor master.

(g) Area A-7. East of a line parallel to and 150 feet from the east pierhead line off Bay Island; north of a line parallel to and 150 feet from the pierhead line off Fernando Street; northwest of the east side of Adams Street extended; and southwest of a line bearing 131° from the flashing green beacon off Bay Island, being parallel to and 100 feet southwest of the southwest line of the main channel.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for recreational and small craft of such size and alignment as permitted by the harbor master.

(h) Area A-8. Northeast of a line parallel to and 270 feet from the southwest pierhead line from Collins Isle to Balboa Island; north of a line bearing 311° from the flashing red beacon off the southwest point of Balboa Island and passing through the flashing red beacon off the south point of Bay Shore, this line being the northeast line of the main channel; southwest of a line parallel to and 150 feet from the southwest pierhead line from Collins Isle to Balboa Island; and southeast of a line bearing 238° from U.S. Station 160.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for recreational and small craft of such size and alignment as permitted by the harbor master.

(i) Area A-9. In Balboa Island Channel, east of a line bearing due north from U.S. Station 151, being 25 feet west of the end of Emerald Avenue; north of a line paral-

lel to and 75 feet from the north pierhead line off Balboa Island; west of the east side of Amethyst Avenue extended; and south of a line parallel to and 150 feet from the north pierhead line of Balboa Island.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for recreational and small craft of such size and alignment as permitted by the harbor master.

(j) Area A–10. Southeast of a line bearing 209° from the flashing red beacon on the southwest point of Balboa Island and passing through the east side of the end of "A" Street; north of an irregular line parallel to and 150 feet from the north pierhead line off Balboa Peninsula from "A" to "K" Streets; south of the south line of the main channel; and south and southeast of an irregular line parallel to and 375 feet from the north pierhead line off Balboa Peninsula.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for recreational and small craft of such size and alignment as permitted by the harbor master.

(k) Area A–11. Northeast of a line bearing 108°30′ from the flashing red beacon at the southwest point of Balboa Island, passing through the flashing red channel buoy No. 4, this line being the northeast line of the main channel; north of a line parallel to and 350 feet from the south pierhead line off Balboa Island; west of the west bulkhead line of the Grand Canal extended; and south of a line parallel to and 150 feet from the south pierhead line off Balboa Island.

NOTE: This area is reserved for recreational and other small craft. Fore and aft moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for recreational and small craft of such size and alignment as permitted by the harbor master.

(l) Area A–12 (Balboa Yacht Club). South of a line parallel to and 150 feet from the south pierhead line off Balboa Island; west of the east end pierhead line off Balboa Island extended and bearing 161°; north of a line parallel to and 700 feet from the south pierhead line off Balboa Island; and east of a line parallel to and 1,000 feet from the east boundary, bearing 161° from the point of intersection of the east bulkhead line of Grand Canal and the south bulkhead line off Balboa Island.

NOTE: This area is reserved for recreational and other small craft. Single moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for pleasure boats and yachts of such sizes and alignments as permitted by the harbor master.

(m) Area A–13. (Revoked.)

(n) Area B–1. Southeast of a line bearing 227° from the flashing red beacon at the southwest corner of Lido Isle and being parallel to and 200 feet from the pierhead line off the southeast end of Rhine Point; northeast of the southwest bulkhead line off Rhine Point extended; north of a line parallel to and 250 feet from the pierhead line between 15th and 18th Streets, this line being the north line of Newport Channel; west of the west side of 15th Street extended; and south of a line parallel to and 220 feet from the pierhead line off the south shore of Lido Isle.

NOTE: This area is reserved for commercial fishing vessels. Fore and aft moorings will be allowed in this area conforming to the City of Newport Beach Harbor Ordinance No. 543 for boats licensed for commercial fishing of such sizes and alignments as permitted by the harbor master.

(o) Area B–2. (Revoked.)

§ 202.100 Los Angeles and Long Beach Harbors, Calif. (a) Area A–1. (Revoked.)

(b) Area A–2. Consisting of three parts in the outer basin of Fish Harbor, on the east and west sides of Fish Harbor Entrance Channel, described as follows:

(1) Part. 1. Beginning at a point at the intersection of westerly side of Fish Harbor Entrance Channel and the outer jetty; thence southwesterly along the jetty about 900 feet to the shore; thence northerly about 500 feet; thence northeasterly about 650 feet, on a line parallel to jetty; thence southeasterly about 500 feet, along the westerly side of Fish Harbor Entrance Channel to the point of beginning.

(2) Part 2. Beginning at a point at the intersection of the east side of Fish Harbor Entrance Channel and Fish Harbor mole (outer Fish Harbor); thence northwesterly along channel line about 850 feet to the southerly side of the Fairway; thence northeasterly and easterly along the southerly side of the Fairway, about 478 and 565 feet respectively to its intersection with Fish Harbor mole; thence southerly and southwesterly along the mole to the point of beginning.

(3) Part 3. Beginning at a point at the intersection of the east side of Fish Harbor Entrance Channel and the northerly side of the Fairway; thence along the northerly side of the Fairway about 565 feet; thence northerly about 129 feet; thence about 138 feet along a line perpendicular to the inner jetty; thence southwesterly along the inner jetty to the east side of Fish Harbor Entrance Channel; thence southeasterly along the east side of the channel to the point of beginning.

NOTE: This area is reserved for recreationel and other small craft. Fore and aft moorings will be allowed in this area conforming to Los Angeles City Ordinance No. 97,629, as the same may be amended or supplemented from time to time. Temporary floats or buoys for marking anchors or moorings in place will be allowed in the east portion of this area. Fixed moorings, piles, or stakes are prohibited in the entire area.

§ 202.105 Avalon Bay, Santa Catalina Island, Calif. Shoreward of a line connecting the promontories known as Casino Point and Bathhouse Point; excluding therefrom the fairways as established by the harbor master, City of Avalon.

NOTE: This area is reserved for yachts and other small craft. Moorings will be allowed in this area conforming to the City of Avalon Ordinance No. 264 of such size and alignment as permitted by the harbor master.

§ 202.110 Santa Monica Harbor, Calif. The waters inclosed by a line 1,000 feet southwest of and parallel to the axis of the Santa Monica breakwater and extending 2,000 feet northwest and 2,000 feet southeast of the ends of the breakwater, lines extending shoreward from and normal to each end of the said line, and the mean high tide line; excluding therefrom the fairways as established by the harbor master, City of Santa Monica.

NOTE: This area is reserved for small craft. Fore and aft moorings will be allowed in this area conforming to the City of Santa Monica Harbor Ordinances Nos. 541, 705, 706, and 1356 for recreational and other small craft of such size and alignment as permitted by the harbor master. Fixed mooring piles or stakes are prohibited.

§ 202.115 Santa Barbara Harbor, Calif. North of the Santa Barbara breakwater; seaward of the line of mean high water; and southwest of a line bearing 46°30′ from the north corner of Bath Street and Cabrillo Boulevard to the end of the Santa Barbara breakwater; excluding a fairway 225 feet wide, 100 feet from each side of and parallel to the Navy pier.

NOTE: Fore and aft moorings will be allowed in this area conforming to the City of Santa Barbara Harbor Ordinance No. 2106 for yachts and small craft of such size and alignment as permitted by the harbor master.

§ 202.120 San Luis Obispo Bay, Calif. Eastward of the San Luis Obispo County wharf; northward of a line bearing 116° from the southeast corner of San Luis Obispo County wharf; and westward of a line bearing 210° from the most seaward extremity of Fossil Point.

§ 202.125 Morro Bay Harbor, Calif. (a) Area A–1. Opposite the town of Morro, beginning at the intersection of the west channel line and the prolongation of the center line of Seventh Street; thence 270° to the mean high water line on the peninsula; thence generally south along the mean high water line to the prolongation of the axis of the south breakwater; thence northeasterly to the intersection of a line 200 feet westerly of and parallel to the east channel line and the prolongation of the center line of Third Street; thence northerly along the line 200 feet westerly of and parallel to the east channel line about 350 feet to its intersection with the west channel line; and thence northwesterly along the west channel line to the point of beginning.

NOTE: This area is reserved for small craft. Temporary floats or buoys for marking anchors or moorings in place will be allowed in this area. Fixed mooring piles or stakes are prohibited.

(b) Area A–2. Beginning at a point on the channel line opposite the angle point near the south end of the revetment; thence southeast along the east channel line to the end of the channel; thence 166°30′ to White Point; thence along the mean high tide line north to the angle point near the south end of the revetment; thence southwest to the point of beginning.

NOTE: This area is reserved for small craft. Temporary floats or buoys for marking anchors or moorings in place will be allowed in this area. Fixed mooring piles or stakes are prohibited.

§ 202.126 Monterey Harbor, Calif. The waters of Monterey Harbor south of the Monterey Breakwater; and shoreward of a line beginning at Point "A" on the south side of the Monterey Breakwater about 750 feet east of the shore and at the westerly extremity of the U.S. Coast Guard wharf along the southerly side of the breakwater; thence 200°, 175 feet, to Point "B"; thence 110°, 1,300 feet, to Point "C"; thence 120° to Point "D" on the northerly extension of the westerly line of Park Avenue, City of Monterey; and thence 168°30′ along the westerly line of Park Avenue extended to the shore; excluding from this area a fairway 125 feet wide whose centerline begins at Point "C" and extends thence 205°, 610 feet, and thence 246°, 720 feet, and the waters between this fairway and the northerly end of Municipal Wharf No. 2 and between the southwesterly end of the fairway and Municipal Wharf No. 1.

§ 202.128 Columbia River at Portland, Oreg. The waters of the Columbia River between Sand Island and Government Island, bounded on the west by pile dike U.S. 5.75 and a line extending true north from the northerly end of the dike to the south shore of Sand Island and bounded on the east by a line bearing 339°15′ true, from a point on Government Island at latitude 45°35′10″, longitude 122°32′41″, to the southerly shore of Sand Island.

Subpart B—Anchorage Grounds:

§ 202.210 San Diego Harbor, Calif. (a) The anchorage grounds. The anchorage grounds for general use shall include all of the navigable waters of the harbor except cable and pipe-line areas, the special anchorage areas described in § 202.90, the seaplane restricted area described in § 207.612 of this chapter, and the following:

(1) Special anchorage for U.S. Government vessels. Shoreward of a line extending from Ballast Point Light approximately 351°30′ to the shore end of the Quarantine Dock.

(2) Seaplane area, U.S. Coast Guard Air Station. An area extending easterly from the Coast Guard Air Station, bounded on the north by a line parallel to and 100 feet bayward of the highwater line, on the east by a line from United States Pierhead Line Station 300 to Bulkhead Station 210 and extended northward and on the south by that portion of the pierhead line between Stations 206 and 300.

(3) Nonanchorage area. A lane between San Diego and Coronado bounded on the east by a line extending southerly from a point 410 feet west of United States bulkhead line Station 220 on the San Diego side of the bay to a point 350 feet west of United States bulkhead line Station 149 on the Coronado side of the bay, and on the west by a line extending due north from the intersections of the west side of "E" Avenue with the south side of First Street, Coronado, and a line extending 225°

from the intersection of the west side of Pacific Highway with the north side of Harbor Drive, San Diego.

(4) Temporary naval anchorage. Beginning at a point on the high-tide line bearing 25°30′, approximately 1,200 feet, from North Tower, Coronado Heights; thence 25°30′, 7,343 feet; thence approximately 351°57′41″; 11,930 feet, to United States Pierhead Line Station 318; thence 261°57′41″, approximately 902 feet, to a point on the east boundary line of the seaplane restricted area approximately 168 feet southerly of a point "e" as described in § 207.612 of this chapter; thence southerly and southwesterly along the boundary line of the seaplane restricted area through point "f" to point "g"; and thence southerly along the high-tide line to the point of beginning.

(b) The regulations. (1) Vessels anchoring in portions of the harbor other than the areas excepted in paragraph (a) of this section shall leave a free passage for other craft and shall not unreasonably obstruct the approaches to the wharves in the harbor.

(2) The special anchorage described in paragraph (a) (1) of this section is reserved exclusively for the anchorage of vessels of the United States Government and of authorized harbor pilot boats. No other vessels shall anchor in this area except by special permission obtained in advance from the Commandant, Eleventh Naval District, San Diego, California.

(3) The seaplane area dsecribed in paragraph (a) (2) of this section is reserved exclusively for the use of seaplanes and their attendant plant. Vessels may pass through the area but are not permitted to anchor in the area at any time.

(4) The area described in paragraph (a) (3) of this section is occupied by submerged pipe lines, power cables, and communication cables and is extensively used as a ferry lane by the San Diego-Coronado ferries. No vessels shall anchor in this area at any time.

(5) The temporary naval anchorage described in paragraph (a) (4) of this section is reserved as a special anchorage for naval vessels of the United States and authorized harbor pilot boats. When the area or a part thereof is not required for the use of naval craft, navigation by other craft may be permitted provided permission is obtained in advance from the Commandant, Eleventh Naval District, San Diego, California.

§ 202.212 Newport Bay Harbor, Calif. (a) The anchorage grounds—(1) Temporary Anchorage C–1. Southeast of a line parallel to and 170 feet from the pierhead line at the east end of Lido Isle; north of a line parallel to and 250 feet north of a line bearing 268° from the flashing green beacon off Bay Island and passing through the beacon off 13th Street, this line being the north line of the main fairway; northwest of a line 120 feet in length bearing 203° from the point of the pierhead line off the west end of Harbor Island; and southwest of the pierhead line off the northeast shore of Lido Isle extended.

(2) Temporary Anchorage C–2. A parallelogram-shaped area, 100 feet wide and 400 feet long, lying 100 feet bayward from and parallel to the existing pierhead line, and adjoining and on the north side of Anchorage C–3 described in subparagraph (3) of this paragraph.

(i) Vessels may anchor temporarily in Temporary Anchorages C–1 and C–2 when necessary and space permits, but shall move promptly when the necessity passes or upon order of the harbor master.

(ii) Vessels anchoring in Temporary Anchorages C–1 and C–2 shall comply with all applicable Pilot Rules, including that requiring anchor lights at night.

(iii) Floats or buoys for marking anchors or mooring in place and fixed mooring piles or stakes are prohibited.

(3) Anchorage C–3. A parallelogram-shaped area, 100 feet wide and 500 feet long, lying 100 feet bayward from and parallel to the existing pierhead line, and adjoining and on the south side of Temporary Anchorage C–2 described in subparagraph (2) of this paragraph.

(i) This area is reserved for recreational and other small craft.

(ii) Fore and aft moorings will be allowed in this area conforming to Orange County Harbor Ordinance No. 490 and other local harbor regulations for recreational and small craft of such size and alinement as permitted by the harbor master.

(iii) All vessels using this area are required to maintain anchor lights from sunset to sunrise.

(b) The regulations. (1) Vessels may anchor temporarily in these areas when necessary and space permits, but shall move promptly when the necessity passes or upon order of the harbor master.

(2) Vessels anchoring in these areas shall comply with all applicable Pilot Rules, including that requiring anchor lights at night.

(3) Floats or buoys for marking anchors or moorings in place and fixed mooring piles or stakes are prohibited.

§ 202.214 Los Angeles and Long Beach Harbors, Calif. (a) The anchorage grounds—(1) Commercial Anchorage A (Los Angeles Harbor). An area north of a line 200 feet from and parallel to the axis of the San Pedro Breakwater; west of a line bearing 172° from Fish Harbor 2 Light and passing through the east white cross on the San Pedro Breakwater; south of the south line of the Super Tanker Channel and Turning Basin, which line is described as follows:

Latitude	Longitude
33°42′50.2″	118°15′40.0″
33°42′45″	118°16′04.0″
33°42′37″	118°16′09.2″
33°42′35.8″	118°16′19″
33°42′38″	118°16′23.3″
33°42′45.4″	118°16′25.7″
33°42′50.1″	118°16′35.2″
33°42′48″	118°16′38.8″

thence southeasterly along the east line of the Cabrillo Beach Marina to latitude 33°42′26″, longitude 118°16′29″,

which point is located on the San Pedro Breakwater.

(i) In this area the requirements of commercial ships will predominate. In case of Navy requirements, see subdivision (iv) of this subparagraph.

(ii) Vessels requiring examination by quarantine, customs, or immigration authorities may anchor in this area when Quarantine Anchorage B is not available for this purpose.

(iii) Fixed mooring piles or stakes and floats or buoys for marking anchors or moorings in place are prohibited.

(iv) Consistent with requirements of commercial navigation the Captain of the Port may, upon request from proper naval authorities, assign naval vessels to designated numbered anchorages within the commercial anchorage areas. For control purposes, the Navy authorities shall prepare and supply to the Captain of the Port and other officials directly concerned, an overlay to U.S. Coast and Geodetic Chart No. 5148 bearing number designations for individual-vessel anchorages in all anchorage areas in Los Angeles and Long Beach Harbors.

(2) Quarantine Anchorage B (Los Angeles Harbor). An area north of a line parallel to and 200 feet from the axis of the San Pedro Breakwater; east of a line bearing 172° from Fish Harbor 2 Light and passing through the east white cross on the San Pedro Breakwater; and southwest of a line bearing 302° from the Los Angeles Harbor Light Station.

(i) Vessels arriving at quarantine and awaiting inspection will anchor in this anchorage, except that if space in this anchorage is not available, then any available anchorage in Anchorages A and C may be temporarily occupied for examination. In case of Navy requirements, see subdivisions (iv) of subparagraph (1) of this paragraph.

(ii) No vessels, except those awaiting quarantine inspection or those in an emergent circumstance, shall anchor in this area. When the emergency has passed, the vessel will at once vacate the area. This anchorage shall not be used for vessels bunkering or working cargo.

(iii) United States Public Health Service quarantine laws and regulations are quoted in part as follows:

"Paragraph 34—Every vessel subject to quarantine inspection, entering a port of the United States, its possessions, or dependencies, shall be considered in quarantine until given free pratique. Such vessels shall fly a yellow flag at the foremast head and shall observe all the other requirements of vessels actually quarantined."

(3) Commercial Anchorage C (Los Angeles and Long Beach Harbors). An area north of a line 200 feet from and parallel to the axis of the Middle Breakwater; northeast of a line about 3,600 feet long, bearing 302° from Los Angeles Entrance East Light; northeast of a line bearing 152° from Fish Harbor 2 Light; south of the Navy restricted area for degaussing ranges, and the newly filled harbor terminal area, extending about 3,500 feet from the shoreline; west and south of Navy Anchorage D; and southwest of the southwest side of Long Beach Channel. This area is basically outlined as follows:

Latitude	Longitude
33°42′40.3″	118°14′40″
33°43′00″	118°15′17.8″
33°43′45.2″	118°15′46.8″
33°43′54.2″	118°15′38.1″
33°44′25.4″	118°13′49″
33°44′06″	118°13′39″
33°44′23″	118°12′40″
33°44′00″	118°12′14″
33°43′25.5″	118°11′13″
33°43′25.5″	118°12′22″
33°42′40.3″	118°14′40″

(i) In this area the requirements of commercial ships will predominate. Vessels requiring examination by quarantine, customs, or immigration authorities for the ports of Los Angeles or Long Beach may anchor in this area when Quarantine Anchorage B is not available for this purpose.

(ii) Fixed mooring piles or stakes and floats or buoys for marking anchors or moorings in place are prohibited.

(iii) In case of Navy requirements, see subdivision (iv) of subparagraph (1) of this paragraph.

(iv) The southeast portion of this anchorage is reserved for use as an explosive anchorage whenever a necessity arises therefor.

(4) Naval Anchorage D (Long Beach Harbor). An area south of the south side of the Naval Base Mole a distance of about 2,200 feet; west of the southwest side of Long Beach Channel; and east of a line bearing 160° from the angle point in the Naval Base Mole. This area is basically outlined as follows:

Latitude	Longitude
33°44′25.4″	118°13′49″
33°44′06″	118°13′39″
33°44′23″	118°12′40″
33°44′40.2″	118°13′00″
33°44′25.4″	118°13′49″

(i) In this area, the requirements of the naval service will predominate.

(ii) Floats or buoys for making anchors or moorings in place and fixed mooring piles or stakes are prohibited, except those which may be required by the Navy and approved by the Captain of the Port.

(5) Naval Anchorage E (Long Beach Harbor). An area north of a line 200 feet from and parallel to the axis of the Long Beach Breakwater; northeast of the northeast side of Long Beach Channel; south and east of a line 600 feet from and parallel to the south and east side of Pier J; east of a line 600 feet from and parallel to a line from the center of the Long Beach Arena (latitude 33°45′50.6″, longitude 118°11′14.8″), to its intersection with the northeast corner of Pier J (latitude 33°45′10″, longitude 118°11′25.5″); south of a line 1,500 feet from and parallel to the newly developed shoreline; and west of a line bearing due north from the east end of the Long Beach

Breakwater. This area is basically outlined as follows:

Latitude	Longitude
33°43′25.3″	118°10′51.0″
33°44′09″	118°12′09″
33°44′13″	118°12′13.2″
33°44′13″	118°10′57.2″
33°45′11.2″	118°11′18.2″
33°45′21.2″	118°11′15.9″

thence 1,500 feet from and parallel to the newly developed shoreline; thence:

Latitude	Longitude
33°44′52″	118°08′02″
33°44′39″	118°08′06″
33°43′25.2″	118°08′06″
33°43′25.3″	118°10′51.0″

(i) In this area, the requirements of the naval service will predominate. Under certain conditions and for sufficient reason, the Captain of the Port may permit anchorage by other than naval vessels. Non-naval vessels shall clear the area immediately when ordered to do so by the Captain of the Port, either for his own reasons or upon request of appropriate naval authorities.

(ii) Floats or buoys for marking anchors or moorings in place and fixed mooring piles or stakes are prohibited, except those which may be required by the Navy and approved by the Captain of the Port.

(iii) The southeast portion of this anchorage is reserved for use as an explosive anchorage whenever a necessity arises therefor.

(iv) A strip in the northerly portion of this anchorage is reserved for use as an emergency seaplane landing area whenever a necessity arises therefor. See § 207.618 of this chapter.

(6) Nonanchorage Area F (Long Beach, Calif.) Mouth of the Los Angeles River. The water area extending westward and northward to the head of navigation from a line drawn from the center of the Long Beach Arena (latitude 33°45′50.6″, longitude 118°11′14.8″) to the northeasterly corner of Pier J (latitude 33°45′10″, longitude 118°11′25.5″), and northward of a line 200 feet northerly of and parallel to the centerline of the diversion dike.

(i) This area is reserved for recreational and other small craft, including aircraft when waterborne.

(ii) Anchoring will not be permitted.

(iii) Moorings and recreational boating activities will be allowed in this area conforming to applicable city of Long Beach ordinances and regulations adopted pursuant thereto.

(iv) A 450-foot fairway channel from the eastern boundary of this area to the Navy Landing and Marina will be maintained free of moorings and other obstructions at all times. Points on the fairway are as follows:

Latitude	Longitude
33°45′17.7″	118°11′24″
33°45′12″	118°11′25″
33°45′45.7″	118°12′10″

(v) The regulations for moorings and recreational use of this area shall be enforced by the city of Long Beach.

(7) Nonanchorage Area G (Los Angeles Harbor). An area extending 1,900 feet south from the existing shoreline, 300 feet wide on each side of the prolongation of the centerline of Ferry Street.

(i) This nonanchorage area is established for the protection of a submerged outfall sewer pipe line.

(ii) No vessel shall anchor within the area at any time.

(iii) Dragging, seining, fishing operations, and other activities which might foul underwater installations within the restricted area are prohibited. Dredging or filling within this area should be conducted so as to avoid fouling any underwater installations, unless other provision has been made for protecting, reconstructing, or relocating any such installations.

(iv) All vessels entering the nonanchorage area shall proceed across the area by the most direct route and without unnecessary delay.

(v) The city of Los Angeles Board of Harbor Commissioners will mark this area with signs readings: "Do not anchor in this area."

(8) Nonanchorage Area H (Los Angeles Harbor). An area known as Cabrillo Beach Marina, west of the east line of the Marina, which line is the prolongation of the west side of West Channel to its intersection with the San Pedro Breakwater at latitude 33°42′26″, longitude 118°16′29″, north of the San Pedro Breakwater; and south and east of the high-tide line.

(i) This area is reserved for recreational and other small craft.

(ii) Anchoring will not be permitted.

(iii) Moorings and recreational boating activities will be allowed in this area conforming to applicable city of Los Angeles ordinances and regulations adopted pursuant thereto.

(iv) The regulations for moorings and recreational use of this area shall be enforced by the city of Los Angeles.

(9) Explosives Anchorage No. 1 (Long Beach Harbor). A circular area within Anchorage C of 300-yard radius with its center at latitude 33°43′35.5″, longitude 118°13′00.8″.

(10) Explosives Anchorage No. 2 (Long Beach Harbor). A circular area within Anchorage E of 300-yard radius with its center at latitude 33°43′44.8″, longitude 118°08′54.8″.

(11) Explosives Anchorages No. 1 and No. 2 Safety Zones (Long Beach Harbor). When an explosives anchorage is occupied by a vessel carrying, loading, or unloading explosives, a circular safety zone surrounding the explosives anchorage of 600 yards or of 1,000 yards in width, as the Captain of the Port may determine, may be declared by the Captain of the Port to be a forbidden anchorage in the interests of port security and commerce. Vessels within such circular safety zone, upon being notified by the Captain of the Port to move or shift position, shall get underway at once or signal for a tug and change position as directed with reasonable promptness.

(b) Regulations. (1) Any vessels, other than those operated by or for the United States, the State of California, the cities of Los Angeles and Long Beach, and Los Angeles County, anchored or moored in the navigable channels or waters outside of the anchorage areas established in this section in Los Angeles or Long Beach Harbors shall be considered prima facie to prevent or obstruct the passage of other vessels or craft.

(2) Anchors must not be placed outside the anchorage areas, nor shall any vessel be so anchored that any portion of the hull or rigging shall at any time extend outside the boundaries of the anchorage areas.

(3) Any vessel anchoring under circumstances of emergency outside of the anchorage areas must be placed near the edge of the channel and in such position as not to interfere with the free navigation of the channel nor obstruct the approach to any pier nor impede the movement of any vessel and shall move away immediately after the emergency ceases.

(4) The maneuvering of a vessel by means of a dragged anchor, except within an established anchorage ground or in stress of weather or to avoid collision, is prohibited. Unnecessary maneuvering in any of the anchorage grounds is prohibited.

(5) The instructions of the Captain of the Port assigning vessel to parts of anchorage grounds suitable to their draft, requiring vessels to anchor bow and stern, or with two bow anchors, requiring shifting the anchorage of any vessel within any anchorage ground for the common safety or convenience or for otherwise enforcing the regulations in this section, shall be promptly complied with by owners, masters, and persons in charge of vessels.

(6) Nothing in this section shall be construed as relieving the owner or persons in charge of any vessels or plant from the penalties of law for obstructing navigation or for obstructing or interfering with range lights, or for not complying with the navigation laws in regard to lights, fog signals, or for otherwise violating law.

(7) Permission to anchor in the channels within the limits of Los Angeles and Long Beach Harbors may be granted by the Captain of the Port to plant or vessels engaged in recovering sunken property or in laying or repairing pipe or cable lines legally established when approved by the District Engineer, Corps of Engineers, and to plant or vessels engaged in dredging operations when authorized by the District Engineer. The provisions of this subparagraph shall not apply to plant or vessels engaged under the supervision of the District Engineer upon works for the improvement of the harbor, but the District Engineer will advise the Captain of the Port in all cases where plant is to be employed under his supervision.

(8) The Captain of the Port is hereby authorized to require any vessel to proceed to designated anchorage, to direct any vessel to shift position, whether inside or outside of an established anchorage area, whenever, at that officer's discretion, such action is considered necessary in the interests of safety and navigation.

(9) Any vessel upon being notified to move as provided in subparagraph (8) of this paragraph into the anchorage limits or to shift its position in anchorage grounds must get underway at once or signal for a tug, and must change position as directed with reasonable promptness.

(10) The regulations in this section shall not be considered to cover all the obligations imposed by law upon vessels and their operators, and shall not be construed as relieving the owners or persons operating vessels from any penalties which might be incurred in the violation of any of the general navigation laws.

(11) Except as otherwise prescribed in this section, no vessel shall occupy an anchorage for more than 10 consecutive days, unless an extended anchorage permit is granted by Captain of the Port. Extended permits will not ordinarily be granted if objectionable to local port authorities. In determining whether an extended anchorage permit will be granted, consideration will be given, but not limited, to the then activities of the port and of problems of safety.

(12) Vessels not in sound and seaworthy condition, or vessels which for any reason may be considered likely to sink or cause a menace or obstructions to navigation, or vessels being dismantled, stripped, or undergoing major alterations shall not enter nor occupy an anchorage except in an emergency, and then only under specific permission from the Captain of the Port. Before granting such specific permission for emergency anchorage, the Captain of the Port will advise the Port Traffic Manager, Port of Long Beach and the Port Warden, Port of Los Angeles, of the emergency and coordinate the granting of such specific permission in light of the then and future activities of the Port and safety relating to the granting of such permission.

(13) Whenever, in the opinion of the Captain of the Port, such action may be necessary, any or all craft in these anchorage areas may be required to have a watchman aboard at all times.

(14) The Captain of the Port may supervise and control the movement of any vessel and shall take full or partial possession or control of any vessel or any part thereof, within the territorial waters of the United States under his jurisdiction, whenever it appears to him that such action is necessary in order to secure such vessels from damage or injury, or to prevent damage or injury to any vessel or waterfront facility or waters of the United States, or to secure the observance of rights and obligations of the United States. (33 CFR Part 6, Subpart 6.04, General Provisions, § 6.04–8, Possession and control of vessels.)

(15) No vessel while carrying, loading, or unloading explosives as commercial cargo, shall anchor in any of the established anchorages, including the explosives anchorages, or in any other areas within Los Angeles and Long Beach Harbors as defined by the San Pedro Middle, and Long Beach Breakwaters, or closer than one nautical mile to any part of said breakwaters in the waters seaward

thereof, without permission of the Captain of the Port. In granting such permission, the Captain of the Port will be guided by the activities in the harbor and safety problems relating to such anchorage. Captain of the Port will advise the Port Traffic Manager, Port of Long Beach and the Port Warden, Port of Los Angeles of any such anchorage assignments of explosive-laden vessels under the following conditions as classified in the regulations entitled "Explosives or Other Dangerous Articles on Board Vessels" (46 CFR Part 146).

(i) Explosives, Class "A", any amount.

(ii) Explosives, Class "B", in excess of 1 net ton at any one time.

(iii) Explosives, Class "C", in excess of 10 net tons at any one time.

(16) The regulations in this section are to be enforced by the U.S. Coast Guard Officer designated as Captain of the Port of Los Angeles-Long Beach. The office of the Captain of the Port is on Pier A in Long Beach Harbor.

§ 202.216 Pacific Ocean at Santa Catalina Island, Calif. (a) The anchorage grounds—(1) Descanso Bay. Shoreward of a line connecting the promontories known as White Rock and Casino Point.

(2) Isthmus Cove. All waters shoreward of a line connecting the promontories known as Lion Head and Blue Cavern Point, excluding the following-described non-anchor area: An area 300 feet wide (170 feet west and 130 feet east of the centerline of the Catalina Island Steamship Line pier), extending 1,600 feet from the root of the pier, and an area 150 feet seaward of the shore line extending approximately 1,500 feet east and 1,500 feet northwest of the centerline of said pier.

(b) The regulations. (1) The Descanso Bay anchorage is reserved for yachts and other small craft. Floats or buoys for marking anchors or moorings in place will be allowed in this area. Fixed mooring piles or stakes are prohibited.

(2) The Isthmus Cove anchorage shall be available for anchorage of all types of craft. Temporary floats or buoys for marking anchors or moorings in place will be allowed in this area. Fixed mooring piles or stakes are prohibited.

(3) The non-anchorage area described in paragraph (a)(2) of this section shall be used only by commercial vessels. Commercial vessels of 15 feet draft or over may anchor in this area seaward of the Catalina Island Steamship Line pier during hours between sunrise and sunset. The use of this area for anchorage is forbidden to all other craft at all times. Fixed mooring piles or stakes and floats or buoys for marking anchors or moorings in place are prohibited.

(4) The instructions of the Captain of the Port requiring vessels to anchor bow and stern, or with two bow anchors, or requiring shifting the anchorage of any vessel within the anchorage grounds for the common safety or convenience, or for otherwise enforcing the regulations in this section, shall be promptly complied with by owners, masters, and persons in charge of vessels.

(5) Nothing in this section shall be construed as relieving the owner or person in charge of any vessels or plant from the penalties of law for obstructing navigation or for obstructing or interfering with range lights, or for not complying with the navigation laws in regard to lights, fog signals, or for otherwise violating law.

§ 202.218 Pacific Ocean at San Clemente Island, Calif.; in vicinty of Wilson Cove. (a) The anchorage grounds. Shoreward of a line beginning at a point on the beach bearing 153° true, 1,400 yards, from the flashing green light on the southeast headland at Wilson Cove; thence 62° true, 0.67 nautical mile; thence 332° true, 1.63 nautical miles; thence 241°31′ true to the shore line.

(b) The regulations. (1) This area is reserved exclusively for anchorage of United States Government vessels or vessels temporarily operating under Government direction, and no vessel, except in an emergency, shall anchor in the area without first obtaining permission from the Commandant, Eleventh Naval District, or the Senior Naval Officer present who shall in turn notify the Commandant promptly.

(2) No vessel shall anchor in such a manner as to unreasonably obstruct the approach to the wharf.

§ 202.220 Pacific Ocean at San Nicolas Island, Calif.; restricted anchorage areas. (a) The restricted areas—(1) East area. All waters within a circle having a radius of one nautical mile centered at latitude 33°13′45″, longitude 119°25′50″ (the former position of San Nicolas Island East End Light), which point bears approximately 101°, 420 yards, from San Nicolas Island East End Light.

(2) West area. Shoreward of a line bearing 276° true from San Nicolas Island south side light a distance of six nautical miles; thence to a point bearing 270° true, two nautical miles, from the westernmost point of the island; thence 60° to a point due north of the northernmost point of the island; thence 180° true to the shore.

(b) The regulations Except in an emergency, no vessel shall anchor in these restricted areas without authority of the Commandant, Eleventh Naval District. Cargo vessels destined for San Nicolas Island may anchor in the east area for unloading or loading.

§ 202.222 Pacific Ocean at Santa Barbara Island, Calif. (a) The anchorage grounds. Shoreward of a line beginning at the Santa Barbara Island Light on the northeast end of the island and bearing 23° true a distance of 1.515 nautical miles seaward from the beach; thence 140°30′ true, 2.54 nautical miles; thence 212°30′ true, 2.30 nautical miles; thence 296°30′ true, 0.96 nautical miles; and thence 325° true to the beach.

(b) The regulations. The anchorage shall be available for anchorage of all types of craft. Temporary floats or buoys for marking anchors in place will be permitted in this area.

§ 202.224 San Francisco Bay, San Pablo Bay, Carquinez Strait, Suisun Bay, San Joaquin River, and connecting waters, Calif. (a) San Francisco Bay—(1) Anchorage 1 (general). (i) That portion of San Francisco Bay bounded by the north shore of the City of San Francisco and lines joining points which are the following bearings and distances from Alcatraz Light: 201°40′, 2,670 yards; 220°20′, 1,800 yards; 251°, 4,210 yards; 234°30′, 4.410 yards.

(ii) All of this area is a general anchorage with the exception of a 333-yard wide cable area therein.

(2) Anchorage 2 (general). That portion of Richardson Bay north of a line bearing 257° from Peninsula Point to the shore at Sausalito, except so much of this area as is included in Naval Anchorage 11 and the improved channel to, and the turning basin at, Sausalito.

(3) Anchorage 3 (general). That portion of Belvedere Cove west of a line bearing 25°30′ from Peninsula Point to the shore at Tiburon.

(4) Anchorage 4 (general). Bounded by the westerly shore of San Francisco Bay and the following lines: Beginning on shore at Bluff Point; thence to a point bearing 286°, 3,630 yards, from Southampton Shoal Light; thence to a point bearing 228°, 4,450 yards from East Brother Island Light; thence along a line bearing 266° to the shore south of Point San Quentin. Excluded from this anchorage are the portions of the following areas included therein: The restricted area at the Naval Net Depot, Tiburon (see § 207.640 (h) of this chapter); Quarantine Anchorage 17 when being used for quarantine purposes; and Explosives Anchorage 13 and the forbidden anchorage zone surrounding it.

(5) Anchorage 5 (general). (i) Bounded by the easterly shore of San Francisco Bay and the following lines: Beginning at the shoreward end of the Standard Oil Wharf at Point Orient; thence along the wharf to the southwest corner thereof; thence to a point bearing 334°30′, 4,050 yards, from Southampton Shoal Light; thence along a line bearing 93° to the shore; except so much of this area as is included in the restricted area. Naval Fuel Annex, Molate Point (see § 207.640 (i) of this chapter), and the improved channel to Richmond Inner Harbor.

(ii) Vessels may anchor in this anchorage immediately adjacent to the improved channel to Richmond Inner Harbor: Provided, That any ship obstructing the channel must move from its position immediately if and when the fairway is required by a vessel navigating the channel.

(6) Anchorage 6 (general). Bounded by the easterly shore of San Francisco Bay and the following lines: Beginning at the shore at the southernmost extremity of Point Isabel; thence along the northerly shore of Brooks Island to the training wall extending westerly therefrom; thence westerly along the training wall to its bayward end; thence to a point bearing 104°, 1,035 yards, from Treasure Island North End Light; thence along a line bearing 144°30′ to a point 290 yards northerly of the center of Pier K of the San Francisco-Oakland Bay Bridge; thence along a line bearing 71° to the shore; excluding from this area, however, the cable areas therein.

(7) Anchorage 7 (Temporary). (i) That portion of San Francisco Bay bounded by the westerly shore of Treasure Island and the following lines: Beginning at the most westerly shore of Treasure Island at a point bearing 89°, 4,135 yards, from Alcatraz Light; thence to points which are the following bearings and distances from Alcatraz Light: 73°30′, 3,100 yards; 117°40′, 2,087 yards; 122°30′, 3,730 yards; 111°00′, 4,167 yards; 109°30′, 3,833 yards; 98°30′, 4,583 yards.

(ii) That portion of this anchorage lying westerly of a line having a bearing of 311°30′ from Pier E of the San Francisco-Oakland Bay Bridge and passing through Point Knox Light on Angel Island, is reserved for the use of vessels while undergoing examination by quarantine, customs, immigration, Coast Guard, and other governmental authorities. Upon completion of these examinations, vessels shall promptly move out of this portion of the anchorage.

(iii) That portion of this anchorage lying easterly of of the said line, having a bearing of 311°30′ from Pier E of the San Francisco-Oakland Bay Bridge, is for use of vessels undergoing examination, as in subdivision (ii) of this subparagraph, and also for use of vessels requiring a temporary anchorage. Vessels shall not remain in this portion of the anchorage for longer than 36 hours.

(8) Anchorage 8 (general). That portion of San Francisco Bay east of the City of San Francisco, the corners of which are the following bearings and distances from the center of the anchor pier (Pier C) of the San Francisco-Oakland Bay Bridge: 118°, 2,635 yards; 175°30′, 2,420 yards; 172°, 3,470 yards; and 168°, 3,520 yards.

(9) Anchorage 9 (general). Bounded on the north by the shore, the breakwater and turning basin at the Naval Air Station, Alameda, and a line from Air Station Channel Lighted Buoy 6 to Air Station Channel Entrance Lighted Buoy 2; bounded on the west by a line beginning at Air Station Channel Entrance Lighted Buoy 2, thence to a point bearing 17°, 4,050 yards, from Hunters Point Light, thence to a point bearing 343°30′, 4,000 yards, from Hunters Point Light, and thence to a point bearing 343°30′, 3,330 yards from Hunters Point Light, and thence 146°; bounded on the south by a line 1,000 yards northerly from and parallel to the Hayward-San Mateo Bridge; and bounded on the east by the shore, including all of San Leandro Bay. The following areas are excluded from this anchorage: The seaplane restricted area, Naval Air Station, Alameda (described in § 207.640(e) of this chapter); Explosives Anchorage 14, Explosives Storage Anchorage 15, and the forbidden anchorage zone surrounding each of these two anchorages.

(10) Anchorage 9–A (general). Shoreward of the following lines: Beginning at the outer end of the south fender of the former automobile ferry slip at the end of the Alameda Mole; thence 270°, 400 yards; thence 216°,

approximately 2,000 yards; thence along a line bearing 127° from Alcatraz Light, 1,200 yards; thence 36° to the shore.

(11) Anchorage 10 (naval). (i) The triangular-shaped area immediately east of Sausalito northwest of a line bearing 234° from Point Stuart Light, and southwest of a line bearing 303° from Alcatraz light.

(ii) This anchorage is for the use of public vessels of the United States, but may be used by yachts when not required for use by public vessels. All yachts making use of this anchorage shall be prepared to move immediately upon notice should the anchorage be required for public vessels. With the permission of the District Commander or Captain of the Port, permanent yacht moorings may be placed within this anchorage, not more than 300 yards from the shore.

NOTE: As used in this section, the term "District Commander" means the Commander, Twelfth Coast Guard District, and the term "Captain of the Port" means the officer who has been designated by the Commandant, U.S. Coast Guard, as Captain of the Port, San Francisco.

(12) Anchorage 11 (naval). (i) That portion of Richardson Bay the corners of which are the following bearings and distances from Point Stuart Light: 273°, 1,150 yards; 271°, 2,520 yards; 257°30′, 2,580 yards; and 248°30′, 1,530 yards; except so much of this area as is included in the improved channel to Sausalito.

(ii) This anchorage is reserved for the exclusive use of vessesls and seaplanes of the United States Navy.

(13) Anchorage 12 (naval). (i) That portion of San Francisco Bay east of the City of San Francisco the corners of which are the following bearings and distances from the center of the anchor pier (Pier C) of the San Francisco-Oakland Bay Bridge: 95°, 3,035 yards; 110°, 980 yards; 188°, 1,170 yards; 175°30′, 2,420 yards; and 118°, 2,635 yards.

(ii) This anchorage is reserved for the use of vessels of the United States or foreign navies and for other public vessels of the United States. With the permission of the District Commander or Captain of the Port, this anchorage may be used temporarily by vessels other than public vessels, but vessels availing themselves of this privilege must hold themselves in readiness to shift berth immediately upon receiving notice to do so.

(14) Anchorage 13 (explosives). (i) A circular area having a radius of 333 yards around a white buoy used to mark its location bearing 51°30′, 1,900 yards, from the northerly extremity of California Point.

(ii) This anchorage is for the use of vessels loaded with, loading, or unloading explosives. This provision is not intended to prohibit lighters and barges from lying alongside ships for transfer of cargo.

(iii) The maximum total quantity of explosives that may be on board vessels in this anchorage shall be limited to 50 tons; except that, at the discretion of the District Commander or Captain of the Port, vessels in transit, loaded with explosives in excess of this limitation, may be permitted to anchor temporarily in this area provided the hatches to the holds containing explosives are not opened.

(iv) A circular zone 667 yards wide partially surrounding the anchorage is a forbidden anchorage zone and shall not be used for anchorage purposes by any vessels.

(15) Anchorage 14 (explosives). (i) The area 1,000 yards wide and 2,760 yards long, the end boundaries of which are semicircles with radii of 500 yards and centers, respectively, 100°00′, 3,270 yards, and 112°30′, 4,800 yards from Hunters Point South End Light, and the side boundaries of which are parallel tangents joining said semicircles. The anchorage is marked at each extremity by a white buoy.

(ii) The anchorage is for the use of vessels loaded with, loading, or unloading explosives. This provision is not intended to prohibit lighters and barges from lying alongside ships for transfer of cargo.

(iii) The maximum total quantity of explosives that may be on board any one vessel moored in this anchorage shall be limited to 3,000 tons. Vessels will be assigned berths in this anchorage by the District Commander or Captain of the Port on the basis of the maximum quantity of explosives that will be on board the vessel.

(iv) Vessels in this anchorage shall not anchor closer than 400 yards to one another but the number of vessels which may anchor in this area at any one time shall be at the discretion of the District Commander or Captain of the Port. This provision is not intended to prohibit barges or lighters from lying alongside vessels for transfer of cargo.

(v) The 667-yard wide area partially surrounding this anchorage is a forbidden anchorage zone and shall not be used for anchorage purposes by any vessels.

(vi) This anchorage and the surrounding forbidden anchorage zone may be temporarily discontinued by the District Engineer, Corps of Engineers, San Francisco, California, when the area is required for general anchorage purposes.

(16) Anchorage 15 (explosives storage). (i) An area 1,000 yards square whose center is marked by a white buoy bearing 124°30′, 9,835 yards, from Hunters Point Light, and whose sides are due north-south and east-west.

(ii) This anchorage is for the purpose of storage of explosives. Barges and vessels shall be anchored so as not to approach within 167 yards of one another. All barges using this anchorage for storage purposes shall anchor with two or more anchors. The District Commander or Captain of the Port may authorize the placing of moorings within this anchorage, provided these moorings are so placed that barges at one mooring shall at all times be not less than 167 yards from barges at an adjacent mooring.

(iii) A square zone 500 yards wide surrounding this anchorage is a forbidden anchorage zone and shall not be used for anchorage purposes by any vessels.

(17) Anchorage 17 (quarantine). An area 1,000 yards square, the easterly side of which is coincident with the easterly boundary of General Anchorage 4 and the north-

easterly corner of which is on the said easterly boundary 97°30′, 2,250 yards, from the northerly extremity of California Point.

NOTE: This anchorage is under the jurisdiction of the Medical Officer in charge of the Port of San Francisco and is included in this section for information only.

(b) San Pablo Bay.—(1) Anchorage 18 (general). Bounded by the westerly shore of San Pablo Bay and the following lines: Beginning at the shore at Point San Pedro; thence 90° to the easterly of the Sisters Islands; thence to points which are the following bearings and distances from Petaluma Creek Entrance Channel Light and Echo Board 2: 202°30′, 1,200 yards; and 288°30′, 5,870 yards; excluding from this area, however, the channel to Hamilton Field and the extension of this channel easterly to the boundary of the anchorage, and the pipeline area therein.

(2) Anchorage 19 (general). Bounded by the northeasterly shore of San Pablo Bay and the following lines: Beginning at the shore at a point bearing 03°15′, 6,830 yards, from Petaluma Creek Entrance Channel Light and Echo Board 2; thence to points which are the following bearings and distances from Petaluma Creek Entrance Channel Light and Echo Board 2: 177°30′, 8,600 yards; 131°, 7,000 yards; 103°00′, 9,500 yards; 95°30′, 13,370 yards, 93°30′, 13,330 yards; and thence along the long dike extending southwesterly from Mare Island to the shore at Mare Island.

NOTE: See § 204.215 of this chapter establishing a target area in San Pablo Bay adjacent to the westerly shore of Mare Island for use of the Mare Island Navy Yard.

(3) Anchorage 20 (general). Bounded by the southeasterly shore of San Pablo Bay and the following lines: Beginning at the northeast corner of Parr Terminal No. 4 at Point San Pablo; thence to a point bearing 14°, 1,135 yards from the northeast corner of the wharf at Pinole Point; thence to a point on the Union Oil Company Pier at Oleum, 206°00′, 1,870 yards from Mare Island Pier 35 Light; and thence along this pier to the shore; excluding from this area Explosive Anchorages 22 and 23.

(4) Anchorage 21 (naval). A rectangular area south of Mare Island the corners of which are the following bearings and distances from the tall stack at the Selby Smelting Works: 331°30′, 1,285 yards; 300°30′, 1,830 yards; 286°30′, 1,530 yards; and 321°, 800 yards.

(5) Anchorage 22 (explosives). (i) A circular area having a radius of 500 yards whose center is at the northwest corner of the wharf of the Atlas Powder Company at Pinole Point.

(ii) This anchorage is for the use of vessels loaded with, loading, or unloading explosives, and this anchorage shall not be used by any other vessel.

(iii) The maximum quantity of explosives that may be in this anchorage at one time shall be limited to 500 tons.

(6) Anchorage 23 (explosives). (i) A circular area having a radius of 500 yards whose center is at the northwest corner of the wharf of the Hercules Powder Company which is located approximately 2,330 yards southwesterly of Lone Tree Point of Rodeo, California.

(ii) This anchorage is for the use of vessels loaded with, loading, or unloading explosives, and this anchorage shall not be used by any other vessels.

(iii) The maximum quantity of explosives that may be in this anchorage at any one time shall be limited to 100 tons.

(c) Carquinez Strait—(1) Anchorage 24 (general). Bounded by the northerly shore of Carquinez Strait and lines joining points which are the following bearings and distances from Port Costa Light: 332°30′, 1,820 yards; 347°, 1,330 yards; 347°, 710 yards; and 109°30′, 1,800 yards.

(2) Anchorage 25 (general). Bounded by the south shore of Carquinez Strait and lines joining points which are the following bearings and distances from Benicia City Wharf Light; 145°30′, 2,970 yards; 141°, 1,970 yards; and 234°, 1,300 yards.

(d) Suisun Bay—(1) Anchorage No. 26 (General). On the west side of Suisun Bay, adjacent to and northeast of the City of Benicia within the following boundaries: The northeast edge of the Southern Pacific Bridge from the north shore to the first siren; thence 77°30′, 430 yards; thence 38°47′, 7,800 yards; thence 312° to shore; thence along the shore to the point of beginning.

NOTE: A portion of Anchorage 26 is occupied by the Suisun Bay Reserve Fleet of the Maritime Administration, and § 207.900 of this chapter establishes a restricted area in the vicinity of this Reserve Fleet.

(2) Anchorage 27 (general). An area in the northeast portion of Suisun Bay lying east of a line due north through tripod on Roe Island at Preston Point; north of a line bearing 84° from fixed range light located 1,187 yards to the southwest of said tripod on Roe Island, to the old lighthouse at the most southerly point of Roe Island; thence bearing 101° to Middle Ground Light, thence bearing 88° Chipps Island.

(e) San Joaquin River—(1) Anchorage 28 (general). The waters adjacent to Lower Sherman Island southeasterly of a line 450 yards long bearing 238° from Sherman Island North End Light; easterly of a line bearing 163°30′ from the west end of said 450-yard line; and northerly of a line bearing 27° from New York Slough East End Light and Echo Board.

(2) [Reserved]

(3) Anchorage 30 (explosives). (i) That portion of the Old San Joaquin River channel bounded on the west by Mandeville Point and on the north, east, and south by lines joining points which are the following bearings and distances from Stockton Channel 3 Light: 341°, 1,400 yards; 348°30′, 1,520 yards; 355°20′, 1,340 yards; 08°30′, 835 yards; and 341°, 870 yards.

(ii) This anchorage is for the use of vessels, lighters, and barges loaded with, loading, or unloading explosives or explosive materials, and shall not be used by any other vessel or craft while such operations are in progress. At all other times the area will be open to fishing and navigation without restriction.

(iii) Notice of loading and unloading operations will be given by notice published by the United States Coast

Guard in "Notice to Mariners", and by notice given by the Port of Stockton to local radio stations and newspapers, and by telephonic means to any organization that may request that such advice be given. In all cases the notice will state how long the operations will be in progress and on what days.

(f) Sacramento River, Decker Island; restricted anchorage for vessels of the United States Government—(1) The anchorage ground. An elongated area in the waters of the Sacramento River adjacent to the northeast shore of Decker Island within the following boundaries: Beginning at Sacramento River Light 4, FL. R., at the northerly tip of Decker Island, thence 90°, 117 yards; thence 180°, 633 yards; thence 184°, 817 yards; thence 186°30′, 450 yards; thence 209°, 467 yards; thence 231°, 383 yards; thence 330° to shore; thence with the shore to the point of beginning.

(2) The regulations. No vessel or other craft except those owned by or operating under contract with the United States shall navigate or anchor within fifty feet of any moored Government vessel in the area. Commercial and pleasure craft shall not moor to buoys or chains of Government vessels, nor shall they, while moored or underway, unreasonably obstruct the passage of Government or other vessels through the area.

(3) Enforcement. The regulations in this paragraph shall be enforced by the Commanding General, San Francisco Port of Embarkation, Fort Mason, California, or his authorized representative.

(g) General regulations. (1) Except in cases of distress, great emergency, or heavy fog, no vessel shall be anchored in the navigable waters of San Francisco Bay, San Pablo Bay, Carquinez Strait, Suisun Bay, New York Slough, San Joaquin River Deep Water Channel, and the Stockton Turning Basin, California, outside of the anchorages defined and established in this section, nor anchor within an improved channel or a cable or pipe line area shown on Government charts, nor be moored, anchored, or made fast to any pier, wharf, bulkhead, or vessel in such manner as to impede or endanger the passage of any vessel in transit by; or to or from, adjacent wharves, piers, slips, or navigation channels.

(2) Whenever in the opinion of the District Commander or Captain of the Port such action may be necessary, that officer may require any or all vessels in any designated anchorage area to moor with two or more anchors. (Vessels using Anchorage 15 for the purpose of storage of explosives will be required to anchor with two or more anchors at all times.)

(3) Every vessel whose crew may be reduced to such number that it will not have sufficient men on board to weigh anchor at any time shall be anchored with two anchors, with mooring swivel put on before the crew is reduced or released.

(4) Anchors shall not be placed outside the anchorage areas, nor shall any vessel be so anchored that any portion of the hull or rigging extends outside the boundaries of the anchorage area.

(5) Vessels anchoring outside of the designated anchorage areas because of distress or heavy fog, shall be placed in such position as not to interfere with navigation or obstruct the approach to any pier, wharf, slip, or boat harbor. They shall move from such position as soon as the emergency ceases or when ordered by the District Commander or Captain of the Port or by his duly authorized representative.

(6) The anchorages will be used only for the purposes stated for each and under the special limitations applicable thereto.

(7) The District Commander or Captain of the Port shall assign berths in the anchorages to all vessels applying for such permission. He may grant permits to those vessels habitually maintaining and using the same mooring place in an anchorage area, and no vessel shall occupy a permanent berth in an anchorage area except under authority of such permit which may be revoked at any time.

(8) A vessel, upon being notified to move into the anchorage limits or to shift its position in the anchorage grounds shall get under way at once or obtain a tug and change its position with reasonable promptness, as directed.

(9) Whenever required by maritime or commercial interests of the United States, the District Commander or Captain of the Port is empowered to shift the position of any vessel anchored within or outside of an anchorage area, of any vessel which is so moored or anchored that its position impedes or obstructs vessel movements in any channel or obstructs or interferes with range lights, and of any vessel which, lying at the exterior end of a pier or alongside of a wharf or bulkhead, obstructs or endangers the passage of vessels to or from adjacent wharf property or impedes the movement of vessels entering or leaving slips and boat harbors.

(10) Permits to anchor in channels within the limits of the waterways covered by the regulations in this section may be granted by the District Commander or Captain of the Port to wrecking plants or other vessels legally engaged in recovering sunken property or in laying pipe or cable lines legally established or in repairing same when the application for such anchorage is approved by the District Engineer, Corps of Engineers, and to plant engaged in dredging operations when authorized by the District Engineer. The provisions of this subparagraph will not apply to plant engaged under the supervision of the District Engineer upon works for the improvement of rivers and harbors, but the District Engineer will advise the District Commander or Captain of the Port in advance of the proposed work for such improvement in all cases where the plant is to be employed under his supervision.

(11) Nothing in this section shall be construed as relieving the owner or person in charge of any vessel from the penalties of law for obstructing navigation or for obstructing or interfering with range lights, or for not complying with the navigation laws in regard to lights, fog signals, or for otherwise violating the law.

(12) (i) Anchorages 13, 14, 15, 22, 23 and 30 are reserved for vessels carrying explosives. All vessels carrying explosives shall be within these areas when anchored, except as provided in subparagraph (15) of this paragraph.

(ii) A written permit shall be obtained from the District Commander or Captain of the Port before vessels carrying explosives, or on which explosives are to be loaded, may proceed to the anchorages provided for them, and no vessel shall occupy a berth in such anchorage except by authority of such permit, which may be revoked at any time.

(iii) At the discretion of the District Commander or Captain of the Port, written permits to occupy a berth in explosive anchorages may be issued to vessels carrying flammable liquids, flammable solids, oxidizing materials, corrosive liquids, compressed gases and poisonous substances. Such permits must be obtained prior to entering the anchorage and are revocable at any time.

(iv) Vessels used in connection with transporting explosives to be loaded on or unloaded from other vessels in explosive anchorage areas, shall obtain and carry a written permit from the District Commander or Captain of the Port. The District Commander or Captain of the Port may, at his discretion, require every person having business on board vessels which are either laden or being loaded with explosives, to have a document which is acceptable to the Coast Guard for identification purposes. Such identification shall be shown whenever required by the District Commander or Captain of the Port.

(13) (i) Whenever any non-self-propelled vessel, or any self-propelled vessel that is unable to maneuver under its own power due to mechanical difficulties, lack of personnel, or for any other reason, occupies explosives anchorages 13, 14, 15, 22, 23 and 30, the District Commander or Captain of the Port may require the attendance of a tug upon such vessels when, in his judgment, such action is deemed necessary.

(ii) Every vessel loading, unloading, or laden with explosives shall, while within an explosive anchorage, display by day at its masthead, or at least 10 feet above the upper deck if the vessel has no masthead, a red flag 16 square feet or more in area, and shall display by night, in the same position specified for the flag, an electric red light visible through 360° for a distance of at least one mile.

(14) When vessels are conducting loading operations from barges at any of the established anchorages, as indicated by the display at its masthead of a red flag by day or a red light by night, passing vessels shall reduce speed to six knots.

(15) The District Engineer, Corps of Engineers, is empowered to authorize in writing, the anchoring of a single barge carrying explosives in or near the vicinity of work being done directly under his supervision, or under a Department of the Army permit, but only in quantities considered by him as safe and necessary. The District Engineer shall prescribe the conditions under which this explosive shall be stored and handled and in each case shall furnish the District Commander or Captain of the Port with a copy of the written permit to anchor explosives on the wharf and a copy of the rules and regulations for storing and handling.

(16) Vessels other than those under Federal supervision shall not go alongside or in any manner moor to any Government-owned vessel, mooring buoy, or pontoon boom, their anchor cables, or any of their appendages. Vessels other than those under Federal supervision shall not obstruct or interfere in any manner with the mooring, unmooring, or servicing of vessels owned by the United States.

(17) Vessels anchoring in the San Joaquin River Deep Water Channel or the Stockton Turning Basin because of distress or heavy fog, shall be placed as near the edge of the channels or turning basin as possible, and in such position as not to interfere with the free navigation thereof, nor obstruct the approach to any pier, wharf, slip, or boat harbor. They shall move from such position as soon as the emergency ceases or when ordered by the District Commander or Captain of the Port, San Francisco. No vessel shall be permanently moored in areas adjacent to the San Joaquin River Deep Water Channel except on permission in writing from the District Commander or Captain of the Port.

§ 202.228 Columbia River, Oreg. and Wash. (a) The anchorage grounds—(1) Lower Tongue Point Anchorage. A rectangular area bounded as follows: Beginning at a point bearing 253°30′, 675 yards, from Tongue Point Light; thence to a point bearing 247°30′, 2,015 yards from Tongue Point Light; thence to a point bearing 261°, 2,125 yards, from Tongue Point Light; thence to a point bearing 284°, 950 yards, from Tongue Point Light; and thence to the point of beginning.

(2) Upper Tongue Point Anchorage. Northwesterly of a line running from a point bearing 42°, 1,200 yards, from Tongue Point Light, to a point bearing 253°30′, 675 yards, from Tongue Point Light; northeasterly of the northeast boundary of Lower Tongue Point Anchorage; southeasterly of a line ranging from a point bearing 284°, 950 yards, from Tongue Point Light, toward a point bearing 24°, 1,425 yards, from Tongue Point Light; southerly of a line 50 yards south of and parallel to the south side of the main ship channel; and southwesterly of a line ranging from a point bearing 42°, 1,200 yards, from Tongue Point Light, toward a point bearing 24°, 1,425 yards, from Tongue Point Light.

(b) The regulations. (1) No vessel shall anchor in anchorages described in paragraph (a) (1) and (2) of this section without prior permission from the Captain of the Port, or his authorized representative. No vessel shall occupy either anchorage for a period longer than 30 days unless a permit is obtained from the Captain of the Port for that purpose. No vessel in a condition such that it is likely to sink or otherwise become a menace or obstruction to the navigation or anchorage of other vessels shall occupy an anchorage except in an emergency and then only for such period as may be permitted by the Captain

691-231 O—63——3

of the Port. A berth in an anchorage, if available, shall be assigned to any vessel by the Captain of the Port upon application and he may grant revocable permits for the continuous use of the same berth.

§ 202.230 Puget Sound area, Wash. (a) The anchorage grounds—(1) Freshwater Bay emergency explosives anchorage, Strait of Juan de Fuca. All of Freshwater Bay and adjacent waters shoreward of a line beginning at Observatory Point, latitude 48°09′03″, longitude 123°38′12″, thence due north approximately 1,150 yards to latitude 48°09′36″, longitude 123°38′12″; thence 90°, approximately 6,450 yards, to latitude 48°09′36″, longitude 123°33′27″; thence 180° to the shoreline.

(i) This area does not constitute an explosives anchorage for loading or discharging explosives, but is established exclusively for use by explosives laden vessels enroute to the ammunition dumping area which encounter adverse weather and sea conditions and are forced to await more favorable conditions before proceeding to sea.

(1–a) Bellingham Bay general anchorage. The waters of Bellingham Bay within a circular area with a radius of 2,000 yards, having its center at latitude 48°44′15″, longitude 122°32′25″.

(1–b) Bellingham Bay explosives anchorage. The waters of Bellingham Bay within a circular area with a radius of 1,000 yards, having its center at latitude 48°42′48″, longitude 122°33′37″.

(2) Port Townsend explosives anchorages—(i) Fair weather anchorage area. A circular area having a radius of 300 yards, whose center is at latitude 48°06′26″, longitude 122°43′46″.

(ii) Foul weather anchorage area. A circular area having a radius of 300 yards, whose center is at latitude 48°04′05″, longitude 122°44′52″.

(3) Holmes Harbor general anchorage. All of Holmes Harbor lying southerly of a line ranging 310° through Hackney Island, between the shores of Whidbey Island.

(4) Port Gardner general anchorage, Possession Sound. Beginning at a point bearing 211°, 560 yards, from Everett Jetty Light; thence 180°, 675 yards; thence 216°, 250 yards; thence 254°, 800 yards; thence 302°, 1,700 yards; thence 49°, 1,280 yards; thence approximately 115°, 1,525 yards, to the point of beginning.

(5) Port Madison explosive anchorage, Puget Sound. The waters of Port Madison south of the 3-fathom line between longitude 122°28′54″ and 122°30′00″, and north of latitude 47°44′00″.

(6) Thorndike Bay emergency explosives anchorage, Hood Canal. Beginning at a point bearing 267°, 3,500 yards, from Hood Canal 5 Light; thence 180°, 1,000 yards, to a point approximately 251°, 3,725 yards, from Hood Canal 5 Light; thence 270°, 1,350 yards, to a point approximately 256°, 5,000 yards, from Hood Canal 5 Light; thence due north 1,000 yards, to a point approximately 268°, 4,900 yards, from Hood Canal 5 Light; thence approximately 90°, 1,350 yards, to the point of beginning.

(7) Smith Cove general anchorage (west), Elliott Bay. Shoreward of a line beginning at Fourmile Rock Light; thence to a point bearing 207°, 1,100 yards, from Fourmile Rock Light; thence southeasterly to point bearing 6°30′, 2,075 yards, from Duwamish Head Light; thence due north to the shore of Smith Cove.

(8) Smith Cove general anchorage (east), Elliott Bay. Beginning at the intersection of the Federal pierhead line and a line drawn along the north side of Denny Way; thence westerly on said line 2,000 feet; thence northwesterly along a line paralleling the Federal pierhead line to its intersection with a straight line drawn along the east side of Pier 88; thence due north to the intersection with the Federal pierhead line; thence along said pierhead line to the point of beginning.

(9) Elliott Bay general anchorage (east). Shoreward of a line beginning at the northeast corner of Harbor Island; thence northerly and in a straight line to its intersection with a line drawn along the south side of King Street; thence west on said line to its intersection with the east line of West Waterway; thence along said line to the northwest corner of Harbor Island.

(10) Elliott Bay general anchorage (west). Shoreward of a line beginning at a point of intersection of the Federal pierhead line with a straight line drawn along the west line of West Waterway; thence north to a point intersecting a straight line drawn along the south side of Dearborn Street; thence in a westerly direction to the foot of West Fairmount Avenue.

(11) Orchard Point general anchorage, Puget Sound. Beginning at Orchard Point Light; thence 106°, two miles; thence 180° to the northern shore of Blake Island; thence west and south along the shoreline to the southern end of Blake Island at approximate longitude 122°29′-16″; thence 250° to the dock at Harper; thence westerly and northerly along the shoreline to the point of beginning.

(12) Blake Island explosives anchorage, Puget Sound. Shoreward of a line bearing 90° from the south tangent of Blake Island, 2,000 yards; thence due north, 1,400 yards; thence 270°, 1,300 yards, to the east point of Blake Island.

(b) The regulations. (1) No vessel shall anchor in any general anchorage described in paragraph (a) of this section without prior permission from the Captain of the Port, or his authorized representative. No vessel shall occupy any general anchorage for a period longer than 30 days unless a permit is obtained from the Captain of the Port for that purpose. No vessel in a condition such that it is likely to sink or otherwise become a menace or obstruction to the navigation or anchorage of other vessels shall occupy a general anchorage except in an emergency and then only for such period as may be permitted by the Captain of the Port. A berth in a general anchorage, if available, may be assigned to any vessel by the Captain of the Port upon application and he may grant revocable permits for the continuous use of the same berth.

(2) Explosive anchorages are reserved for vessels carrying explosives. All vessels carrying explosives shall be within these areas when anchored.

(3) Whenever any vessel not fitted with mechanical power, anchors in an explosive anchorage, the Captain of the Port may require the attendance of a tug upon such vessel, when, in his judgment, such action is necessary.

(4) Vessels carrying explosives shall comply with the general regulations in subparagraph (1) of this paragraph, when applicable.

(5) Every vessel at anchor in an explosives anchorage shall display by day a red flag at least 16 square feet in area at its mast head or at least 10 feet above the upper deck if the vessel has no mast, and by night a red light in the same position specified for the flag. These signals shall be in addition to day signals and lights required to be shown by all vessels when at anchor.

(6) Every vessel constructed of wood shall, unless there are steel bulwarks or metallic cases or cargo on board, be fitted with radar reflector screens of metal of sufficient size to permit target indication on the radar screen of commercial type radars.

(7) Fishing and navigation by pleasure and commercial craft are prohibited within the area at all times when vessels which are anchored in the area for the purpose of loading or unloading explosives display a red flag by day and a red light by night, unless special permission is granted by the Captain of the Port.

(8) No explosives handling in any explosive anchorage will be undertaken by any vessel unless personnel from the Captain of the Port are on board to supervise the handling of explosives.

(9) No vessel shall remain at anchor in any explosive anchorage unless there is on board such vessel a competent watchman or a tug in attendance.

§ 202.235 Pacific Ocean (Mamala Bay), Honolulu Harbor, Hawaii; anchorage for nitrate laden vessels. (a) The anchorage ground. The waters of the Pacific Ocean (Mamala Bay) within an area directly offshore of Keehi Lagoon at Honolulu, Hawaii, described as follows: Beginning at a point bearing 251° true, 5,925 yards, from Honolulu Harbor Light (Aloha Tower); thence on a bearing of 202° true, 1,000 yards; thence on a bearing of 290°30′ true, 800 yards; thence on a bearing 22° true, 1,000 yards; thence on a bearing of 110°30′ true, 800 yards to point of beginning. This area provides anchorage space for one (1) vessel.

(b) The regulations. (1) Anchorage within this area shall be restricted to not more than one (1) nitrate laden vessel at any one time. Other vessels are cautioned against frequenting the area at any time, and they shall not, without specific authority from the District Commander, enter or remain in the area when a nitrate laden vessel is anchored within or is approaching the area, or anchor outside the area within 1,000 yards of a nitrate laden vessel anchored within the area.

NOTE: The term "District Commander," as used in this section, means the Commander, 14th Coast Guard District, Honolulu, Hawaii, or his duly authorized representative.

(2) Except in an emergency involving danger to life or property, no nitrate laden vessel shall anchor within the area without first obtaining permission from the District Commander. The master of a nitrate laden vessel shall notify the District Commander in advance of his intention to anchor within the area, giving the name of the vessel and the time he expects to anchor and any additional information requested such as the reason for the stopover, anticipated period of the stopover, kind and amount of cargo carried, destination, and proposed location of any necessary torches or welding anticipated, etc. The vessel shall not enter the area until permission to anchor has been received from the District Commander, and it shall then anchor along the longitudinal center line of the area 600 yards from any corner as designated by the District Commander.

(3) The master of the vessel shall request permission from the District Commander for any necessary additional stopover privilege longer than the period originally anticipated. He shall also notify the District Commander when his vessel is ready to leave the area.

(4) In addition to the appropriate day and night signals, the anchored vessel shall display by day a red flag of at least 16 square feet, and by night a red light visible all around the horizon, at the mast head or at least 10 feet above the upper deck if the vessel has no mast.

(5) The master of the vessel shall have the vessel properly patrolled at all times, and anchor bearings carefully checked at frequent intervals. During rough seas, if he is in doubt as to being securely anchored and is without ship power he shall call for tug service from any of the commercial tug-service firms available in Honolulu Harbor. All charges incurred thereby shall be charged to the vessel owner or agent.

(6) Upon being notified to shift its position a vessel shall get under way at once or signal for a tug and change position as directed with reasonable promptness.

(7) In the event of fire on board any anchored vessel, the master or other officer in charge shall immediately sound five blasts of five seconds each of a whistle or siren, which signal may be repeated at intervals to attract attention. This signal shall be used in addition to any other means available for reporting a fire. If for any reason the whistle signal is inoperative the master shall make arrangements whereby the radio transmitter and operator will be available.

(8) Nothing in this section shall be construed as relieving the owner or person in charge of any vessel from strict compliance with all applicable navigation laws and regulations established by the Commandant of the Coast Guard with respect to explosives and other dangerous articles and substances on board vessels.

§ 202.336 Pacific Ocean off Barbers Point, Island of Oahu, Hawaii; Anchorage for tank vessels. (a) The anchorage ground. The waters of the Pacific Ocean within an area described as follows: Beginning at a point at latitude 21°16′58″ N., longitude 158°04′39″ W.; thence on a bearing of 90° true, 850 yards; thence on a bearing

of 180° true, 450 yards; thence on a bearing of 270° true, 850 yards; thence on a bearing of 360° true, 450 yards to point of beginning.

(b) The regulations. (1) This anchorage is for the use of tank vessels loaded with, loading, or unloading oil, and shall not be used by any other vessel except as provided in subparagraph (9) of this paragraph.

(2) The anchorage will be used only for the purposes stated and under the special limitations applicable thereto.

(3) When tank vessels are conducting loading or unloading operations as indicated by the display of a red flag (International Code Flag "B") at the masthead, passing vessels of over 100 tons displacement will reduce speed to six (6) knots over the ground.

(4) Owners of tank vessels shall notify the Captain of the Port, 14th Coast Guard District, Honolulu, and the Commanding Officer, U.S. Naval Air Station, Barbers Point, not less than twenty-four (24) hours prior to actual occupancy of the anchorage ground by a tank vessel. Such notification shall include the maximum height above the waterline of the uppermost portion of the tank vessel's masts and a description, including height of the highest anchor light which will be displayed by the vessel at night when at anchor.

(5) During periods when Navy mining training is being conducted in the mining area defined in this subparagraph, owners of tank vessels shall insure that these vessels remain clear of this area. Frequency of mining operations will be approximately twice a year. The mining area is contained within the rectangle formed by the following coordinates:

Latitude	Longitude
21°17′21″ N.	158°03′43″ W.
21°17′40″ N.	158°01′53″ W.
21°17′09″ N.	158°01′48″ W.
21°16′51″ N.	158°03′37″ W.

(6) Owners of tank vessels shall delay actual occupancy of the anchorage ground by a tank vessel for a period not to exceed forty-eight hours approximately twice a year upon notification by the Commander, Naval Air Bases, 14th Naval District. Such notification shall be received not less than two weeks in advance.

(7) Tank vessels engaged in loading or unloading operations will normally occupy the area every two to three weeks with an occupancy time therein of approximately thirty-six hours per tank vesesl.

(8) The use of this anchorage will neither restrict nor prohibit in any manner the operation of military aircraft over or near the anchorage, or the operation of naval vessels or other craft in the immediate vicinity.

(9) The following vessels only shall navigate or anchor in the area:

(i) Tank vessels using the mooring for loading or unloading operations.

(ii) Vessels belonging to the United States Government.

(iii) Commercial tugs, lighters, barges, and launches engaged in business pertaining to the mooring area.

(10) Tank vessels equipped with a "Butterworth" system shall refrain from employing such equipment during occupancy of the anchorage area.

(11) Vessels occupying the area shall refrain from pumping of bilges.

(12) Permanent mooring buoys may be installed within the area subject to Department of the Army permits being obtained for such installations.

(13) Nothing in this section shall be construed as relieving the owner or person in charge of any vessel from the penalties of law for not complying with the navigation laws in regard to lights, fog signals, or for otherwise violating the laws.

(14) The regulations of this section shall be enforced by the Captain of the Port, U.S. Coast Guard, Honolulu, and such agencies as he may designate.

PART 203—BRIDGE REGULATIONS:

§ 203.1 General. Drawbridges across navigable waters of the United States will not be opened to navigation for certain periods determined to be in the interest of public safety by the proper civil defense authorities during ing a major disaster or civil defense emergency indicated by a civil defense condition of "Air Raid Warning" (attack by enemy aircraft probable, imminent, or taking place) notwithstanding any general or special regulations heretofore or hereafter prescribed for the operation of any such drawbridge or drawbridges.

§ 203.710 Navigable waters of the United States within the State of California; bridges generally. (a) Operation requirements. The owners of or agencies controlling drawbridges shall provide the necessary tenders and the proper mechanical appliances for the safe, prompt, and efficient opening of the draws for the passage of vessels.

(b) Signals—(1) Sound signals. To be used if weather conditions are such that sound signals can be heard:

(i) Call signal for opening of draw. Three long blasts, sounded within reasonable hearing distance of the bridge, repeated if necessary, and in time to give due notice to the draw tender.

NOTE: As used in this section, the term "long blasts" means distinct blasts of a whistle or horn or calls through a megaphone of four seconds' duration, or loud and distinct strokes of a bell.

(ii) Acknowledging signals—(a) When draw can be opened immediately. Same as call signal.

(b) When draw cannot be opened immediately, or when it is open and must be closed immediately. Two long blasts, repeated at regular intervals until acknowledged by the vessel. The vessel shall acknowledge by the same signal. Thereafter, as soon as the draw can be opened, the draw tender shall repeat the call signal.

(2) Visual signals. To be used if weather conditions are such that sound signals may not be heard:

(i) Call signal for opening of draw. A white flag by day or a white lighted lantern by night, swung in vertical

circles at arm's length in full sight of the bridge and facing the draw.

(ii) Acknowledging signals—(a) When draw can be opened immediately. Same as call signal, to be given in full sight of the vessel.

(b) When draw cannot be opened immediately, or when it is open and must be closed immediately. A red flag by day or a red lighted lantern by night, swung in vertical circles at arm's length in full sight of the vessel, repeated until acknowledged by the vessel. The vessel shall acknowledge by the same signal, given in full sight of the bridge and facing the draw. Thereafter, as soon as the draw can be opened, the draw tender shall repeat the call signal, given in full sight of the vessel.

(3) Fog signal. When fog prevails by day or by night the draw tender, after repeating the call signal, shall toll a bell continuously during the approach and passage of the vessel.

(c) Prompt opening required except when delayed by train. The draw shall be opened with the least possible delay on receiving the prescribed signal: Provided, That the draw shall not be opened when a train is approaching so closely that it cannot be stopped safely before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the draw tender.

(d) Interference with operation of bridge prohibited. Trains and vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall watercraft be navigated so as to hinder or delay the operation of the draw, but all passage over or through a drawbridge shall be prompt to prevent delay to either land or water traffic.

(e) Vessels for which openings not required. A drawbridge shall not be required to open for any vessel carrying appurtenances unessential for navigation which extend above the normal superstructure, if the height of the normal superstructure would permit the vessel to pass under the closed bridge. Military masts shall be considered as part of the normal superstructure.

NOTE: On request, the District Engineer, Corps of Engineers, in charge of a waterway will cause an inspection to be made of the superstructure and appurtenances of a vessel habitually frequenting that waterway with a view to adjusting any differences of opinion in this matter between the vessel owner and a bridge owner.

(f) Bridges requiring advance notice for prompt opening. (1) The owners of or agencies controlling bridges for the prompt opening of which advance notice is required by special regulations (§§ 203.712 to 203.718, inclusive) need not keep draw tenders in constant attendance at such bridges.

(2) Whenever a vessel, unable to pass under a closed bridge, desires to pass through the draw, advance notice, as specified in the special regulations, of the time the opening is required must be given to the authorized representative of the owner of or agency controlling the bridge to insure prompt opening thereof at the time required. Unless otherwise provided in the special regulations, such advance notice may be given at any regular office of the owner of or agency controlling the bridge. Such notice may also be given to the draw tender or to the person named in the notice posted on the bridge in accordance with sub-paragraph (4) of this paragraph.

(3) On receipt of such advance notice, the authorized representative, in compliance therewith, shall arrange for the prompt opening of the draw on proper signal at approximately the time specified in the notice.

(4) The owners of or agencies controlling the bridges shall keep conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can be read easily at any time, a copy of the special regulations pertaining to the respective bridges together with information as to whom notice should be given when it is desired that a bridge be opened and directions for communicating with such person by telephone or otherwise.

(5) Vessels desiring to pass through these bridges without having given advance notice as specified in the special regulations may be delayed, but the owners of or agencies controlling the bridges shall, under such circumstances, use every reasonable means to expedite openings.

(6) The operating machinery of the draws shall be maintained in a serviceable condition, and the draws shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

NOTE: The following special regulations (§§ 203.711 to 203.718, inclusive), modifying and supplementing the foregoing general regulations (§ 203.710), are prescribed for certain bridges where local conditions warrant.

§ 203.711 Los Angeles and Long Beach Harbors, Calif. (a) Long Beach Entrance Channel; temporary retractable pontoon bridge—(1) Closed periods. From 7:00 to 8:00 a.m., and from 4:00 to 5:15 p.m., daily except Sundays and holidays for Federal employees, this bridge will not be required to open for the passage of vessels, except in case of extreme emergency.

(2) Signals. The call signal for opening the bridge shall be one long blast followed by two short blasts. This signal shall be acknowledged by two long blasts followed by one short blast when the bridge can be opened immediately, and by two long blasts when the bridge cannot be opened immediately.

NOTE: As used in this section, the term "long blasts" means distinct blasts of a whistle or horn or calls through a megaphone of four seconds' duration, and the term "short blasts" means distinct blasts of a whistle or horn or calls through a megaphone of one second's duration.

(3) Signs. The owner of or agency controlling the bridge shall keep conspicuously posted on the south and north sides thereof, in such manner, that they can be easily read from approaching vessels, signs showing the call and acknowledging signals prescribed in subparagraph (1) of this paragraph.

(b) Cerritos Channel; Commodore Schuyler F. Heim highway bridge, and Henry Ford (formerly Badger) Avenue railroad and highway bridge approximately 130 feet westerly thereof—(1) Closed periods. From 6:45 to

8:00 a. m. and from 4:00 to 5:15 p. m. daily, except Sundays and holidays for Federal employees, the draw of the Commodore Schuyler F. Heim bridge will not be required to open for the passage of vessels, except in case of extreme emergency. The draw of the Henry Ford Avenue bridge shall be opened with the least possible delay at any time on receiving the prescribed signal.

(2) Signals for opening both bridges. The call signal for opening the draws of both bridges at once shall be three long blasts. This signal shall be acknowledged by two long blasts followed by one short blast when the draws of both bridges can be opened immediately and by two long blasts when the draw of either bridge cannot be opened immediately.

NOTE: The bridges are connected electrically to insure that the call signal of three long blasts will not be acknowledged by the opening signal unless both bridges can be opened.

(3) Signals for opening of Henry Ford Avenue bridge only. The call signal for opening the draw of the Henry Ford Avenue bridge only shall be two short blasts followed by one long blast. This signal shall be acknowledged by two long blasts followed by one short blast when the draw can be opened immediately, and by two long blasts when the draw cannot be opened immediately.

(4) Signs. The owners of or agencies controlling these bridges shall keep conspicuously posted on the east side of the Commodore Schuyler F. Heim bridge and the west side of the Henry Ford Avenue bridge, in such manner that they can be easily read from approaching vessels, signs showing the call and acknowledging signals prescribed in subparagraphs (2) and (3) of this paragraph.

§ 203.712 Tributaries of San Francisco Bay and San Pablo Bay, Calif. (a) Mud Slough; Southern Pacific Company railroad bridge near Alviso. At least 24 hours' advance notice required.

(b) Newark Slough; Southern Pacific Company railroad bridge near Newark. At least 24 hours' advance notice required. To be given to the Superintendent, southern Pacific Company, Oakland Pier, Oakland, California.

(c) San Leandro Bay; State of California highway bridge between Alameda and Bayfarm Island. From 9:00 p.m., to 5:00 a.m., the draw need not be opened for the passage of vessels. From 5:00 a.m., to 8:00 a.m. and from 5:00 p.m., to 9:00 p.m., at least 12 hours' advance notice required, to be given to the operator of the Bayfarm Island Bridge (telephone LAkehurst 2-2969) between 8:00 a.m. and 5:00 p.m., and to the operator of the Park Street Bridge, Alameda (telephone LAkehurst 2-7282) at all other times.

(d) Oakland Tidal Canal; Department of the Army highway and railroad bridge at Fruitvale Avenue. All vessels, except motorboats without tow, are forbidden to approach within 300 feet of this bridge for the purpose of eventual passage through the draw except during slack water or when opposing the tidal flow. Vessels and barges shall not attempt passage through the draw while running with the tide, and the bridge will not be opened for vessels under such conditions.

(e) Corte Madera Creek; The Northern Pacific Railroad Company bridge near Greenbrae. On Saturdays, Sundays and holidays, at least 72 hours' advance notice required; on all other days at least 24 hours' advance notice required.

(f) Novato Creek; State of California highway bridge near Ignacio. (Revoked).

(g) Petaluma Creek—(1) Northwestern Pacific Railroad Company bridges at Blackpoint and Haystack Landing. The owner of or agency controlling these bridges need not keep draw tenders in constant attendance except when the draws are closed for the passage of railroad traffic. At all other times the draws may remain in full open position and unattended. During foggy weather a bell shall be tolled continuously when the draws are in open position.

(2) City of Petaluma highway bridges at "D" and Washington Streets, Petaluma. At least 6 hours' advance notice required, to be given to the Petaluma Police Department, telephone Petaluma 2-2727.

(h) Sonoma Creek—(1) State of California highway bridge (Sears Point Cutoff Bridge). At least four hours' advance notice required. To be given to the operator of the State of California highway bridge (Sears Point Cutoff Bridge) across Napa River at Vallejo.

(2) Northwestern Pacific Railroad Company bridge at Wingo. At least 24 hours' advance notice required.

(i) Mare Island Strait, Napa River, and their tributaries—(1) Department of the Navy bridge (Mare Island Causeway) and State of California highway bridge (Sears Point Cutoff Bridge) at Vallejo. From 7:00 a.m. to 8:00 a.m. and from 4:15 p.m. to 5:15 p.m. daily, except Saturdays, Sundays, and holidays, the draws need not be opened for the passage of vessels other than vessels owned, operated, or controlled by the United States.

(2) Southern Pacific Company railroad bridge at Brazos. The owner of or agency controlling this bridge need not keep a draw tender in constant attendance except when the draw is closed for the passage of railroad traffic. At all other times the draw may remain in full open position and unattended. During foggy weather a bell shall be tolled continuously when the draw is in open position.

(3) State highway bridge near Imola. At least 24 hours' advance notice required. To be given to State Highway Superintendent at the Highway Office, 3161 Jefferson Street, Napa, California, telephone Baldwin 6-3184 or Baldwin 6-6290.

(4) Dutchman Slough; James Irvine Bridge. At least 24 hours' advance notice required.

(5) Devil Slough; Russ Investment Company highway bridge. At least 24 hours' advance notice required.

§ 203.713 Minor tributaries of Suisun Bay, Calif. (a) Pacheco Creek; Contra Costa County highway bridge and Southern Pacific Company railroad bridge near Martinez. At least 24 hours' advance notice required.

(b) Cordelia Slough; a tributary of Suisun Slough; Southern Pacific Company railroad bridge. At least 24 hours' advance notice required.

§ 203.714 San Joaquin River and its tributaries, California. (a) San Joaquin River—(1) Stockton Port District railroad bridge between Rough and Ready Island and Stockton. At least 12 hours' advance notice required. To be given to the Director of the Port, Stockton Port District, Stockton, California.

(2) San Joaquin County highway bridge between Rough and Ready Island and Stockton. At least 12 hours' advance notice required. To be given to the San Joaquin County Highway Department or to the County Surveyor at Stockton, California.

(3) Atchison, Topeka and Santa Fe Railway Company bridge near Stockton. At least 12 hours' advance notice required. To be given to the bridge owner's agent at Stockton, California.

(4) State of California highway bridge (Garwood Bridge). At least 12 hours' advance notice required. To be given to the Division of Highways Maintenance Superintendent, 1200 Wilson Way, Stockton, California.

(5) San Joaquin County highway bridge (Brandt Bridge). At least 12 hours' advance notice required. To be given to the County Surveyor of San Joaquin County, Stockton, California.

(6) Southern Pacific Company railroad bridge, State of California highway bridges (Mossdale Bridges), and Western Pacific Railroad Company bridge, near Lathrop.

(i) The owners of or agencies controlling these bridges will not be required to open the drawspans for the passage of vessels, except in the event of an emergency upstream requiring the use of large floating plant, when the openings shall be accomplished within a reasonable period of time.

(7) Drawbridges above Paradise Dam. At least seven days' advance notice required.

(b) Burns Cutoff; San Joaquin County highway bridges (Jacobs Road and Upper Highway Bridges) between Roberts Island and Rough and Ready Island. At least two days' advance notice required. To be given to the County Surveyor of San Joaquin County, Stockton, California.

(c) Middle River—(1) San Joaquin County highway bridge between Bacon Island and Lower Jones Tract. On Sundays and national holidays, and between 5:00 p.m. and 8:00 a.m. on all other days, at least 12 hours' advance notice required, to be given to the County Surveyor of San Joaquin County, Stockton, California, except that if, during crop moving seasons, 20 or more passages through the bridge in any 30-day period are contemplated and 15 days' notice is given of the proposed traffic, the owner will be required to keep a draw tender in constant attendance for the duration of such period.

(1-a) The Atchison, Topeka and Santa Fe Railway Company bridge near Middle River Station. At least 12 hours' advance notice required, to be given the railway company's agent at Stockton, California, except that if, during crop moving seasons, 20 or more passages through the bridge in any 30-day period are contemplated and 15 days' notice is given of the proposed traffic the owner will be required to keep the draw tender in constant attendance for the duration of such period.

(2) State of California highway bridge between Victoria Island and Drexler Tract. At least 12 hours' advance notice required. To be given to the Division of Highways Maintenance Superintendent, 1200 Wilson Way, Stockton, California.

(3) San Joaquin County highway bridge between Union Island and Drexler Tract, at Fish Camp Landing. At least 24 hours' advance notice required. To be given to the County Surveyor of San Joaquin County, Stockton, California.

(4) San Joaquin County highway bridge (Williams Bridge) between Union Island and Roberts Island. At least two days' advance notice required. To be given to the County Surveyor of San Joaquin County, Stockton, California.

(d) Mormon Channel; City of Stockton highway bridge (Washington Street Bridge), Atchison, Topeka and Santa Fe Railway Company bridge (Edison Street Bridge), and City of Stockton (Lincoln Street Bridge). (1) The signal for opening at once all three of these bridges shall be the call signal described in § 203.710 (b) (1). The signal for opening any one of these bridges, and that bridge only, shall be as follows: For the Washington Street Bridge, two long blasts followed by one short blast; for the Edison Street Bridge, two short blasts followed by one long blast; and for the Lincoln Street Bridge, one long blast followed by one short blast and one long blast.

(2) At least 12 hours' advance notice required. To be given to the representative of the City of Stockton and to the railway company's agent at Stockton, California.

(e) King Island Cut; San Joaquin County highway bridge between King Island and Bishop Tract. At least 12 hours' advance notice required. To be given to the San Joaquin County Highway Department or to the County Surveyor at Stockton, California.

(f) Honker Cut; San Joaquin County highway bridge between Empire Tract and King Island. At least 12 hours' advance notice required, to be given to the County Surveyor of San Joaquin County, Stockton, California, except during crop moving seasons when, in the opinion of District Engineer the constant attendance of a draw tender is warranted, and the operators of vessels engaged in the crop moving operations give 15 days' written notice to the District Engineer of the contemplated traffic.

(g) Little Potato Slough; State of California highway bridge at Terminous. (1) The owner of or agency controlling this bridge shall keep a draw tender in constant attendance: (i) From 8:00 a. m. to 5:00 p. m. during the months of July to September, inclusive.

(ii) During periods when, in the opinion of the District Engineer, Corps of Engineers, an emergency exists; or during crop moving seasons when, in the opinion of the District Engineer, the attendance of a draw tender is required, provided the operators of vessels engaged in the crop moving operations give 15 days' written notice to the District Engineer and at the same time furnish sufficient evidence that such service is necessary to take care of the contemplated traffic. In the event that special periods are established by the District Engineer for the constant attendance of a draw tender during an emer-

gency or a crop moving season, information concerning the hours and lengths of such periods will be published in local newspapers and in the "Notice to Mariners" issued by the United States Coast Guard.

(2) From 5:00 p. m. to 8:00 a. m. during the months of July to September, inclusive, when a draw tender is not in attendance, advance notice required; to be given to the draw tender verbally, or by telephone through the Lodi Exchange, before 4:00 p. m. At all other times, at least 12 hours' advance notice required; to be given to the Division of Highways Maintenance Superintendent, 1200 South Wilson Way, Stockton, California.

(h) Mokelumne River, including North and South Forks—(1) Mokelumne River—(i) State of California highway bridge near East Isleton. The owner of or agency controlling this bridge shall keep a draw tender in constant attendance from 9:00 a. m. to 5:00 p. m. throughout the year; and during periods when, in the opinion of the District Engineer, Corp of Engineers, an emergency exists, or during crop moving seasons when, in the opinion of the District Engineer, the attendance of a draw tender is required provided the operators of vessels engaged in the crop moving operations give 15 days' written notice to the District Engineer and at the same time furnish sufficient evidence that such service is necessary to take care of the contemplated traffic. In the event that special periods are established by the District Engineer for the constant attendance of a draw tender during an emergency or a crop moving season, information concerning the hours and lengths of such periods will be published in local newspapers and in the "Notice to Mariners" issued by the United States Coast Guard. When a draw tender is not in attendance, advance notice required; to be given to the draw tender verbally, or by telephone through the Isleton Exchange, before 4:00 p. m.

(ii) Drawbridges above New Hope Landing. At least two days' advance notice required.

(2) North Fork; Sacramento and San Joaquin Counties Highway bridge (Millers Ferry Bridge). At least 12 hours' advance notice required. To be given to the San Joaquin County Highway Superintendent or to the County Surveyor at Stockton, California.

(3) South Fork; San Joaquin County highway bridge (New Hope Landing Bridge). (i) The signal for opening this bridge shall be two long blasts followed by one short blast.

(ii) At least 12 hours' advance notice required. To be given to the San Joaquin County Highway Superintendent or to the County Surveyor at Stockton, California.

(i) Snodgrass Slough; Southern Pacific Company railroad bridge and Sacramento County highway bridge. From 8:00 a. m. to 5:00 p. m., daily, at least 24 hours' advance notice required. From 5:00 p. m. to 8:00 a. m., the draws need not be opened for the passage of vessels except in cases of extreme emergency.

NOTE: As used in this section, the term "long blasts" means distinct blasts of a whistle or horn or calls through a megaphone of four seconds' duration, and the term "short blasts" means distinct blasts of a whistle or horn or calls through a megaphone of one second's duration.

§ 203.715 Georgiana Slough, Calif. (a) Sacramento County highway bridge near Isleton. (1) The signal for opening this bridge shall be four long blasts.

NOTE: As used in this section, the term "long blasts" means distinct blasts of a whistle or horn or calls through a megaphone of four seconds' duration.

(2) The owner of or agency controlling this bridge shall keep a draw tender in constant attenance from 8:00 a.m. to 5:00 p.m. throughout the year, and from 5:00 p.m. to 8:00 a.m. from June to September, inclusive, during such other periods as regular crop movements may justify, and during periods when, in the opinion of the District Engineer, Corps of Engineers, an emergency exists. In the event that the crop moving season is started eariler than June 1 or is extended later than September 30, the period for prompt opening of the bridge on proper signal from 5:00 p.m. to 8:00 a.m. shall be adjusted accordingly, provided the operators of vessels navigating this waterway give 15 days' written notice to the County Engineer of Sacramento County that such an adjustment is necessary to take care of contemplated traffic. At all other times, at least 12 hours' advance notice required. To be given to the operator of the Sacramento County highway bridge across Sacramento River at Walnut Grove.

(b) Southern Pacific Company railroad bridge near Isleton. The signal for opening this bridge shall be four long blasts.

(c) Sacramento County highway bridge near Walnut Grove. (1) The signal for opening this bridge shall be four long blasts.

(2) The owner of or agency controlling this bridge shall keep a draw tender in constant attendance from 8:00 a.m. to 5:00 p.m. throughout the year, and from 5:00 p.m. to 8:00 a.m. from June to September, inclusive, during such other periods as regular crop movements may justify, and during periods when, in the opinion of the District Engineer, an emergency exists. In the event that the crop moving season is started eariler than June 1 or is extended later than September 30, the period for prompt opening of the bridge on proper signal from 5:00 to 8:00 a.m. shall be adjusted accordingly: Provided, The operators of vessels navigating this waterway give 15 days' written notice to the County Engineer of Sacramento County that such an adjustment is necessary to take care of contemplated traffic. At all other times, at least 12 hours' advance notice required. To be given to the operator of the Sacramento County highway bridge across Sacramento River at Walnut Grove.

§ 203.716 Sacramento River and its tributaries, California. (a) Sacramento River—(1) Sacramento County highway bridge at Walnut Grove and State of California highway bridge at Paintersville. (i) For signaling vessels proceeding downstream and upstream the owner of or agency controlling the Sacramento County highway bridge

shall provide lights which shall be operated in conjunction with sound and visual signals from the bridge. The lights shall be visible to approaching vessels and shall be located on the east side of the river. The lights for directing downbound traffic shall be located approximately 3,500 feet upstream from the bridge. The lights for directing upbound traffic shall be located approximately 750 feet downstream from the bridge. When the draw of the bridge can be opened a flashing green light shall be operated. When the draw of the bridge cannot be opened immediately, a flashing red light shall be operated.

(ii) When weather conditions prevent hearing sound signals and obstructions prevent seeing lantern signals, a vessel proceeding downstream may signal for opening of the draw of each of these bridges by swinging the beam of its searchlight from side to side in a vertical arc of about 60 degrees. If the draw can be opened immediately the draw tender shall so signal by projecting a steady beam of his searchlight vertically into the air and holding it steadily in that position until the vessel passes through the draw. If the draw tender finds, after giving the opening signal, that the bridge cannot be opened, he shall extinguish his searchlight immediately, but shall relight it when he is able to open the bridge.

(2) Southern Pacific Company railroad bridge at Sacramento. The signal for opening this bridge shall be four long blasts.

NOTE: As used in this section, the term "long blasts" means distinct blasts of a whistle or horn or calls through a megaphone of four seconds' duration, and the term "short blasts" means distinct blasts of a whistle or horn or calls through a megaphone of one second's duration.

(3) Southern Pacific Company railroad bridge and State of California highway bridge at Knights Landing. (i) The signal for opening at once both of these bridges shall be the call signal described in § 203.710 (b)(1). The signal for opening either of these bridges, and that bridge only, shall be as follows: For the railroad bridge, two long blasts followed by one short blast; and for the highway bridge, two short blasts followed by one long blast.

(ii) When weather conditions prevent hearing sound signals and obstructions prevent seeing lantern signals, a vessel proceeding downstream may signal for opening of the draw of each of these bridges by swinging the beam of its searchlight from side to side in a vertical arc of about 60 degrees. If the draw can be opened immediately the draw tender shall so signal by projecting a steady beam of his searchlight vertically into the air and holding it steadily in that position until the vessel passes through the draw. If the draw tender finds, after giving the opening signal, that the bridge cannot be opened, he shall extinguish his searchlight immediately, but shall relight it when he is able to open the bridge.

(iii) The owner of or agency controlling each bridge shall keep a draw tender in constant attendance from 8:00 a.m. to 5:00 p.m., and at all times during periods when, in the opinion of the District Engineer, an emergency exists, or during a hauling season which requires 20 or more passage through the bridge in any 30-day period provided 15 days' written notice of the contemplated traffic is given by the operators of the hauling vessels to the Southern Pacific Company's Division Engineer at Sacramento and to the Division of Highways Maintenance Superintendent at Woodland, respectively. At all other times, advance notice required. To be given to the Southern Pacific Company's Chief Dispatcher at Sacramento and to the Division of Highways Maintenance Superintendent, respectively, before 4:00 p.m.

(4) Colusa County highway bridge at Colusa. At least 12 hours' advance notice required. To be given to the Colusa County Sheriff's office at Colusa, California.

(5) State of California highway bridge at Butte City. At least 24 hours' advance notice required. To be given to the California State Highway Commission or to its representative in the vicinity.

(6) Drawbridges above Chico Landing. At least seven days' advance notice required.

(b) Steamboat Slough, State of California highway bridge at the head of Grand Island. (1) From 9:00 a.m. to 5:00 p.m., the bridge shall be opened promptly on receipt of the prescribed signal from a vessel desiring to pass through the bridge. Between 5:00 p.m. and 9:00 a.m. advance notice required before 4:00 p.m., to be given to the draw tender verbally or by telephone through the Courtland Exchange, or to be given to the State Highway Maintenance Superintendent at Fairfield.

(2) The signal for opening this bridge shall be two long blasts followed by one short blast.

(c) Miner Slough—(1) Prospect Farms pontoon bridge between Ryer Island and Prospect Island. At least 12 hours' advance notice required. To be given to the Superintendent of Prospect Farms through the Courtland Exchange, or to the main office of Prospect Farms in San Francisco, Calif.

(2) State of California highway bridge between northerly end of Ryer Island and Holland Tract. At least 12 hours' advance notice required. To be given to the Division of Highways Maintenance Superintendent, Rio Vista, Calif.

(3) Continuous attendance of the draws when Prospect Slough is impassable. In the event that Prospect Slough is impassable for any reason, the owners of or agencies controlling these bridges shall, on notification of that fact, provide continuous attendance of the draws during the period of such blocking and conseqnent hauling season on Miner Slough. Vessel owners shall notify the owners of or agencies controlling these bridges promptly, under such conditions, of the removal of obstruction from Prospect Slough or the termination of their shipping movements through Miner Slough.

(d) Sutter Slough; Sacramento County highway bridge near Courtland. (1) The signal for opening this bridge shall be four long blasts.

(2) At least eight hours' advance notice required. To be given to the Sacramento County Engineer or to the op-

erator of the Sacramento County highway bridge across Sacramento River at Walnut Grove.

(e) American River; Sacramento County highway bridge at Sacramento. At least 4 days' advance notice required. To be given to the Sacramento County Engineer at Sacramento, California.

§ 203.718 Eureka Slough, near Eureka, Calif. At least 24 hours' advance notice required.

§ 203.720 Coos Bay, Oreg. (a) Bridge (highway) across South Inlet. (1) The county highway drawbridge across South Inlet shall open for the passage of vessels or other watercraft of any description upon verbal request to the person in charge of said drawbridge. The bridge tender is J. J. Burns, who lives at the west end of the bridge. In his absence R. G. De Merritt, who resides at the west end of the bridge, is in charge.

(2) Notice shall be placed on said bridge stating where said tenders may be found in case it is necessary for the draw to be opened.

(b) Bridge of the Willamette-Pacific Railroad Co. (1) The drawspan of the railroad bridge below North Bend shall be kept open at all times except while actually required for the necessary passage of trains over the drawspan.

(2) During foggy weather a fog bell installed in the center of the drawspan shall be rung continuously, striking every 10 seconds.

(3) At any time during foggy weather, when the draw is closed and the passage is not clear for boats, there shall be sounded continuously a siren which may be heard at a distance of 1 mile from the drawspan. When the bridge is again opened the siren shall be stopped, indicating that the way is clear for the passage of boats.

(c) Highway and railroad bridges across Coal Bank Inlet. (1) The railroad drawbridge and the county highway drawbridge across Coal Bank Inlet shall open for the passage of vessels or other watercraft of any description upon verbal request to the persons in charge of said drawbridges. The bridge tender for the railroad drawbridge is located in the Marshfield depot of the Southern Pacific Co. The bridge tender for the county drawbridge is the county road supervisor, F. P. Morton, of Marshfield, Oreg.

(2) Notice shall be posted on each of the bridges described in subparagraph (1) of this paragraph stating where said tenders may be found in case it is necessary for draws to be opened.

§ 203.725 Umpqua River, Oreg. (a) Bridge of Willamette-Pacific Railroad Co. at Reedsport, Oreg. (1) The drawspan of the bridge across the Umpqua River at the mouth of Smith River shall be promptly opened for the passage of steamboats or other watercraft upon the following signals: One long blast of the whistle followed quickly by one short blast and one long blast.

(2) Vessels or other watercraft without power shall hail the bridge by horn or megaphone, or the bridge tender shall be notified by verbal communication of the desire to pass through the drawspan.

(3) During foggy weather an answering signal of one long blast from the whistle on the bridge will indicate that everything is clear and the draw open for the passage of boats. An answering signal from the whistle on the bridge of a succession of short blasts will indicate that there is some difficulty in immediately opening the draw, due to a passing train or some other cause.

(b) Bridge (highway) at Reedsport, Oreg. (1) The owner of or agency controlling the bridge shall provide the appliances and the personnel necessary for the safe, prompt, and efficient opening of the draw at any time during the day or night for the passage of any vessel or other watercraft, which cannot pass under the closed draw, when the following signal is received:

(i) One long blast followed immediately by one short blast of a whistle, siren, trumpet, horn or megaphone, or one loud and distinct stroke of a bell.

(ii) When the draw of the bridge can be opened immediately the draw tender shall reply by one long blast of a whistle, horn, siren, trumpet or megaphone, or one loud and distinct stroke of a bell.

(iii) If the draw of the bridge cannot be opened immediately, the draw tender shall reply by a succession of short blasts of a whistle, horn, siren, trumpet, or megaphone or loud and distinct ringing of a bell.

(2) A copy of the regulations in this section shall be conspicuously posted on both the upstream and downstream sides of the bridge in such manner that it can be easily read at any time.

(3) The operating machinery of the draw shall be maintained in a serviceable condition, and the draw opened and closed at least once every 4 months to make certain that the machinery is in proper order for satisfactory operation.

§ 203.730 Siuslaw River, Oreg. (a) Oregon State Highway Commission bridge at Florence. (1) The owner of or agency controlling this bridge shall provide the appliances and personnel necessary for the safe, prompt, and efficient opening of the drawing at any time during the day or night for the passage of any vessel or other watercraft which cannot pass under the closed draw, when the call signal is received.

(2) The call signal for opening the draw shall be one long blast of a whistle, siren, trumpet, horn, or megaphone followed immediately by one short blast, or one loud and distinct stroke of a bell. When the draw of the bridge can be opened immediately the draw tender shall reply by one long blast of a whistle, horn, siren, trumpet, or megaphone or one loud and distinct stroke of a bell. If the draw of the bridge cannot be opened immediately, the draw tender shall reply by a succession of short blasts of a whistle, horn, siren, trumpet, or megaphone, or loud and distinct strokes of a bell.

(3) The operating machinery of the draw shall be maintained in a serviceable condition, and the draw shall be opened and closed at intervals frequent enough to make

certain that the machinery is in proper order for satisfactory operation.

(4) A copy of the regulations in this paragraph shall be conspicuously posted on both the upstream and downstream sides of the bridge in such manner that it can be easily read at any time.

(b) Southern Pacific Company railroad bridge at Cushman. (1) Whenever a vessel unable to pass under the closed bridge desires to pass through the draw, at least 24 hours' advance notice of the time the opening is required shall be given to the authorized representative of the owner of or agency controlling the bridge.

(2) Upon receipt of such advance notice, the authorized representative shall, in compliance therewith, arrange for the prompt opening of the draw at the time specified in the notice for the passage of the vessel.

(3) The operating machinery of the draw shall be maintained in a serviceable condition, and the draw shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

(4) The owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can be read easily at any time, a copy of the regulations in this paragraph together with a notice stating exactly how the authorized representative may be reached.

§ 203.739 Umpqua River, Dean Creek, Little Nestucca River, and Skipanon River, Oreg.; bridges. The Oregon State Highway Department drawbridges across Umpqua River, Mile 11.0, side channel, near Gardiner, north of Bolon Island; Dean Creek at its mouth near Reedsport; Little Nestucca River, Mile 2.0, near Oretown; and Skipanon River, Mile 2.5, upstream from Warrenton need not be opened for the passage of vessels.

§ 203.740 Youngs Bay, Walluski River, Lewis and Clark River, Skipanon River, John Day River, Blind Slough, and Clatskanie River, Oreg.; bridges. (a) The drawbridges across Youngs Bay, Walluski River, Lewis and Clark River, Skipanon River, John Day River, and Blind Slough, all in Clatsop County, Oreg., and the bridge across Clatskanie River, in Columbia County, Oreg., shall be promptly opened for the passage of vessels or other watercraft upon the following signals:

(1) Spokane, Portland & Seattle Ry. bridge across Youngs Bay at Smith Point, one long blast followed quickly by one short blast.

(2) Youngs Bay highway bridge at foot of Fifth Street, Astoria, Oreg., two long blasts followed quickly by one short blast.

(3) Walluski River highway bridge, one long blast followed quickly by three short blasts.

(4) Lewis and Clark River highway bridge, near the mouth, one long blast followed quickly by four short blasts.

(5) Skipanon River railroad and highway bridges at Warrenton, Oreg. (both to be opened on one signal), one long blast followed quickly by one short blast.

(6) John Day River, Spokane, Portland & Seattle Ry. bridge, one long blast followed quickly by one short blast.

(7) John Day River highway bridge. (See special regulations in § 203.745.)

(8) Blind Slough, Spokane, Portland & Seattle Ry. bridge, one long blast followed quickly by one short blast.

(9) Clatskanie River, Spokane, Portland & Seattle Ry. bridge, one long blast followed quickly by one short blast.

(b) The bridges listed in paragraph (a) of this section shall be opened for the passage of vessels or watercraft of any kind upon prescribed signals being given on any form of whistle, horn, siren or trumpet, or upon verbal request of the person in charge of such vessel or watercraft except that the draw of the highway bridge across Youngs Bay at the foot of Fifth Street, Astoria, Oregon, shall not be required to open for vessels habitually using the waterway carrying appurtenances unessential for navigation which extend above the normal superstructure, unless such vessel has in tow a vessel which is unable to pass under the closed draw. Military masts shall be considered as a part of the superstructure.

NOTE: On request, the District Engineer, Corps of Engineers in charge of the waterway, will cause an inspection to be made of the superstructure and appurtenances of a vessel habitually frequenting the waterway with a view to adjusting any differences of opinion in this matter between the vessel and the bridge owner.

(c) This section shall take effect and be in force on and after December 15, 1929, and shall supersede the regulations approved November 7, 1899, governing the operation of the above-mentioned bridges.

§ 203.745 John Day River, Oreg.; bridge (highway). (a) The owner of or agency controlling the bridge will not be required to keep a draw tender in constant attendance at this bridge.

(b) Whenever a vessel unable to pass under the closed bridge desires to pass through the draw, at least 12 hours' advance notice of the time the opening is required shall be given to the authorized representative of the owner of or agency controlling the bridge.

(c) Upon the receipt of such notice, the authorized representative of the owner of or agency controlling the bridge, in compliance therewith, shall arrange for the prompt opening of the draw at the time specified in the notice for the passage of the vessel.

(d) The owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides of the bridge in such manner that it can easily be read at any time a copy of the regulations in this section, together with a notice stating exactly how the representative specified in paragraph (b) of this section may be reached.

(e) The operating machinery of the draw shall be maintained in a serviceable condition, and the draw opened and closed at least once each quarter to make certain that the machinery is in proper order for satisfactory operation.

§ 203.750 Willamette River at Portland, Oreg., Columbia River at Vancouver, Wash., and North Portland Harbor (Oregon Slough), Oreg.; bridges (highway and railroad): Signals. (a) Call signals for opening of draw. These signals shall be as prescribed for each bridge in paragraph (b) of this section. It is given by vessels as notice to bridge operators to open the draw, or in case the draw is already open, that they intend to pass through. A call signal given twice in rapid succession indicates that vessel has authority to pass bridges during closed periods (see paragraph (f)(1) of this section).

(b) Answering signals—(1) Acknowledging signal. Shall be the same as the call signal for each bridge. Its purpose is to acknowledge the call signal of a vessel and to indicate that the operator intends to open the draw as soon as practicable, or that he will hold it open.

(2) Danger signal. Shall consist of a series of short blasts, at least four, given in rapid succession, and repeated if necessary. Its purpose is to answer the call signal of a vessel, but to indicate that the draw cannot or will not be opened at once, or, when vessels are waiting in the vicinity, that the draw, if open, is about to be closed. It is also to be used in emergency to revoke an acknowledging signal.

(3) Rescinding signal. Shall be the reverse of the call signal for each bridge. It is given by a vessel to cancel a previous call signal, to indicate that the vessel does not intend to pass through and that the draw need not be opened, or may be closed.

(4) Answer to rescinding signal. (i) Answer by the bridge operator to a rescinding signal shall be the danger signal (see subparagraph (2) of this paragraph).

(5) Call signals. The following call signals are prescribed for vessels wishing to have the drawspans opened or held open.

(i) Spokane, Portland & Seattle Ry. bridge, at Vancouver, Wash., one long followed by one short blast.

(ii) Interstate Highway Bridge, at Vancouver, Wash., two long followed by one short blast.

(iii) Spokane, Portland & Seattle Ry. bridge, at North Portland Harbor (Oregon Slough), one long followed by three short blasts.

(iv) Spokane, Portland & Seattle Ry. bridge, at St. Johns, Oreg., one long followed by one short blast.

(v) Broadway Bridge, two long followed by one short blast.

(vi) Oregon-Washington Railroad & Navigation Co. bridge, one long followed by one short blast.

(vii) Burnside Bridge, one long followed by two short blasts.

(viii) Morrison Bridge, one long followed by three short blasts.

(ix) Hawthorne Bridge, one long followed by four short blasts.

Call signals may be given on any form of whistle, horn, siren, or trumpet with sufficient range or volume to be heard by bridge operators.

(c) To bridge owners. All bridges to which this section applies shall be equipped with suitable air whistles of sufficient size and range that signals sounded on same shall be distinctly audible up and down stream under adverse wind and weather conditions for a distance of 2,500 feet, except for the Spokane, Portland & Seattle Ry. Co. bridges over Columbia and Willamette Rivers, which shall have a range of at least 5,000 feet under the same conditions.

(d) To navigators. (1) A vessel, desiring at any time (except during closed periods, see paragraph (f) (1) of this section) to pass through any of the above-mentioned bridges, under which it cannot pass with the draw closed, shall sound the call signal for such bridge as prescribed in paragraph (b) of this section, and shall repeat such signal at intervals until it is answered by the operator of the bridge (see paragraphs (a) and (e) of this section). In case two vessels approaching from opposite directions would meet at or near the bridge, the vessel bound downstream shall be considered as having the right of way. When either vessel waits for passage of the other, it shall again give the call signal for the bridge and receive acknowledgment before proceeding. It is incumbent upon navigators to make sure that their signals are understood before proceeding through a drawspan, and when approaching bridges, vessels should be kept under control, with a view to stopping, if necessary, before reaching the bridge.

(2) Vessels authorized to pass through bridges during closed periods, as provided in paragraph (f) (1) of this section, shall sound the call signal twice in rapid succession. Signals to open shall be given by vessels at a distance of at least 1,000 feet from the bridge, except in case of a vessel leaving a wharf or anchorage or when waiting less than 1,000 feet from the bridge. In such cases the signal shall be given early enough to allow the operator of the bridge sufficient time in which to clear and open the draw before arrival of the vessel.

(3) All vessels when passing any bridge shall be moved as expeditiously as is consistent with established rules governing speed in the harbor of Portland, and all towboats engaged in handling other craft or in towing logs through any of the bridges shall be of sufficient power to handle the tow without unduly delaying the closing of the drawspan.

(4) Vessels with hinged or adjustable masts or booms projecting above their fixed structures shall lower same and pass under the bridge, if practicable, without signaling for the draw to open.

(e) To bridge operators. (1) If the bridge can be opened, or is already open, when a call signal is given, the operator shall promptly answer the vessel calling by giving the acknowledging signal and promptly open the draw (except during closed periods, see paragraph (f) (1) of this section) or hold it open, as the case may be.

(2) In case the draw cannot be opened at once when the call signal is given, the operator shall promptly answer the vessel calling by giving the danger signal and shall repeat same, if necessary. As soon as the exigency which prevented opening has been removed the bridge operator shall promptly sound the regular acknowledging signal for that bridge to advise vessels that the draw can be opened at once, and he shall thereupon

proceed to open same if there is a vessel waiting to pass through.

(3) When two vessels arrive at a bridge at or near the same time and blow the call signal, lift spans, when opened, shall be raised high enough to clear the taller vessel. If either vessel at any drawbridge waits for passage of the other and again gives the call signal, the bridge operator shall promptly answer with the acknowledging signal and shall hold the span open. In case the intentions of a waiting vessel are not understood by a bridge operator, when the draw is open he shall sound the danger signal as a warning to vessels that he is about to close the draw.

(4) If a rescinding signal is given by a vessel to cancel a previously given call signal, and it is evident the vessel does not intend to pass through, the bridge operator shall answer with the danger signal (four or more short blasts) and may then close the draw, or need not open it.

(f) Closed periods. (1) The periods from 7:30 a. m. to 9 a. m. and 4:45 p. m. to 6:15 p. m. are hereby designated closed periods during which the drawspans of bridges carrying street traffic over Willamette River at Portland shall not be opened to navigation except as below provided, or when necessary to prevent accident.

(2) Closed periods above defined shall not be effective on Sundays, New Year's Day, Washington's Birthday, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, and Christmas Day, or days observed in lieu of these under State law: Provided, That closed periods shall not apply against harbor patrol or fireboats answering calls, nor ocean-going vessels of 750 gross tons or over which are entering the harbor from points outside Willamette River: And provided further, That upon securing the approval and permission of the harbor master, but not otherwise, other ocean-going vessels of 750 gross tons or over may signal for and pass through these bridges at any hour. Vessels desiring and authorized to pass through bridges during closed periods as provided in subparagraph (1) of this paragraph, or in case of emergency when opening of the draw is necessary to prevent accident, shall sound the call signal twice in rapid succession, i.e., with an interval of not over 5 seconds between signals. Drawspans shall be opened, however, for ocean-going vessels of 750 gross tons or over under the rule in paragraph (e) of this section whether the vessel gives a single or double call signal.

§ 203.755 Willamette River, Oreg.; bridges above Oregon City, Oreg. (a) Southern Pacific Company's bridge at Salem. (1) Except as provided in subparagraph (2) of this paragraph, the drawspan shall be opened promptly for the passage of river craft unable to pass under the closed bridge upon the following signal: One long blast, followed quickly by one short blast; or upon verbal request of the operator of any watercraft of his desire to have the drawspan opened.

(2) When river stages are below 20 feet, Corps of Engineers gauge, and a vessel unable to pass under the bridge desires to pass through the draw, at least 24 hours' advance notice of the time the opening is required shall be given to the authorized representative of the owner or agency controlling the bridge. Such advance notice may be given to the dispatchers of the Southern Pacific Company at Portland or to the Southern Pacific Company Agent at Salem.

(3) Upon receipt of such advance notice, arrangements shall be made for the prompt opening of the drawspan at the time given in the notice for passage of the vessel, and the draw shall be so opened.

(4) The owner or agency controlling the bridge shall keep a copy of the regulations in this paragraph conspicuously posted on both the upstream and downstream sides of the bridge, in such place and manner that it can be easily read from the river at any time.

(b) Southern Pacific Company's bridge at Albany, Oreg., and Benton County highway bridge at Corvallis, Oreg. (1) Whenever a vessel unable to pass under the Southern Pacific Company's railroad bridge at Albany, or the Benton County highway bridge at Corvallis, desires to pass through the draw of either bridge, at least 6 hours' advance notice of the time the opening is required shall be given to the authorized representative of the owner or agency controlling the bridge through which passage is desired.

(2) Upon receipt of such advance notice, arrangements shall be made for the prompt opening of the draw at the time given in the notice for passage of the vessel, and the draw shall be so opened.

(3) The owner or agency controlling the bridge shall keep a copy of the regulations in this paragraph conspicuously posted on both the upstream and downstream sides of the bridge, in such place and manner that it can be easily read from the river at any time, together with a notice stating exactly how the representative specified in paragraph (b) (1) of this section may be reached.

(4) The operating machinery of the draws of these bridges shall be maintained in a serviceable condition, and the draw opened and closed at least once each three months, to insure that the machinery is in proper order for satisfactory operation.

§ 203.758 Skamokawa Creek, Wash.; Washington State Highway Bridge at Skamokawa. The draw of the bridge need not be opened for the passage of vessels.

§ 203.759 Columbia River; Oregon-Washington Bridge Company highway bridge between Hood River, Oreg., and White Salmon, Wash. (a) The owner of or agency controlling the bridge will not be required to keep a draw tender in constant attendance.

(b) Whenever a vessel unable to pass under the closed bridge desires to pass through the draw, at least 12 hours' advance notice of the time the opening is required, and the vertical clearance required for the vessel, shall be given to the authorized representative of the owner of or agency controlling the bridge.

(c) Upon receipt of such notice, the authorized representative, in compliance therewith, shall arrange for the prompt opening of the draw upon signal at the time specified in the notice for the passage of the vessel.

(d) The call signal for opening of the draw shall be one long blast followed by two short blasts and one long blast. When the draw has been opened sufficiently to pass the vessel, the draw tender shall reply by waving conspicuously a green flag by day or a green light by night. When the draw cannot be opened immediately, or when it is open and due to an emergency must be closed immediately, the draw tender shall reply by waving conspicuously a red flag by day or a red light by night.

(e) The owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides of the bridge, in such manner that it can be easily read at any time, a copy of the regulations in this section, together with a notice stating exactly how the authorized representative may be reached.

(f) The operating machinery of the draw shall be maintained in a serviceable condition, and the draw shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

§ 203.759a Columbia River; Spokane, Portland and Seattle Railway Company bridge between Wishram, Wash., and Celilo, Oreg. (a) The owner of, or agency controlling the bridge, shall provide the necessary equipment, controls and personnel necessary for the safe, prompt and efficient opening of the draw upon signal at any time of the day or night for the passage of any vessel or other watercraft which cannot pass under the closed draw.

(b) The call signal for opening the draw shall be one long blast of a whistle, siren, trumpet, horn or megaphone, followed immediately by one short blast. When the draw of the bridge can be opened immediately or if the draw is open and will be held open, for the passage of the vessel, the draw tender shall reply by one long blast of a whistle, siren, trumpet, horn or megaphone, followed by one short blast. If the draw cannot be opened immediately the draw tender shall reply by a succession of short blasts on a whistle, siren, trumpet, horn or megaphone.

(c) The operating machinery of the draw shall be maintained in a serviceable condition and the draw shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper condition for prompt operation.

(d) The owner of, or agency controlling the bridge, shall keep conspicuously posted on both the upstream and downstream sides of the bridge, in such a manner that it can be easily read at any time, a copy of the regulations of this section.

§ 203.760 Columbia and Snake Rivers in vicinity of Pasco, Wash.; bridges. (a) Bridges covered by the regulations of this section. (1) The Union Pacific Railroad Company bridge across the Columbia River about 5 miles downstream from Pasco, Washington.

(2) The Northern Pacific Railway Company bridge across the Columbia River between Pasco and Kennewick, Washington.

(3) The Northern Pacific Railway Company bridge across the Snake River at Burbank, Washington.

(b) Posting of regulations. The owner of or agency controlling each bridge shall keep conspicuously posted on the bridge a copy of the regulations of this section together with a notice stating exactly how the representative stated below may be reached. The regulations of this section and notice shall be posted on both the upstream and downstream sides of the bridge and in such a manner that they can be easily read at all times. The names, addresses, and telephone numbers of the bridge representatives are as follows:

(1) For the Union Pacific Railroad Company bridge—The Chief Dispatcher, Spokane, Washington, telephone Main 4121.

(2) For the Northern Pacific Railway Company bridges—The General Yardmaster, Clark and Tacoma Streets, Pasco, Washington, telephone 6242 or 4401.

(c) Advance notification. The owners or operators of vessels requiring that the drawspan of either of the bridges owned by the Northern Pacific Railway Company referred to above, be opened between the hours of 4:00 p.m. and 8:00 a.m., will notify the representative of the bridge owner at least 2 hours in advance of the estimated time of arrival of the vessel at the bridge.

(d) Signals. (1) Call signals for opening of draw. The following signals shall be given by vessels as notice to bridge tender to open the draw, or in case the draw is already open, that they intend to pass through.

(i) Sound signals. (a) For the Union Pacific Railroad Company bridge, 2 long blasts and 1 short blast, sounded at least 10 minutes and not more than 30 minutes before passage is desired.

(b) For the Northern Pacific Railway Company bridges, 1 long blast and 2 short blasts, sounded at least 10 minutes and not more than 30 minutes before passage is desired.

(ii) Visual signals. A white flag by day or a white light at night, swung in full circles at arm's length in full sight of the bridge and facing the draw.

(2) Answering signals—(i) Acknowledging signals. Shall be the same as the call signal for each bridge. The purpose of the signal is to acknowledge the call signal of a vessel and to indicate that the bridge tender intends to open the draw as soon as practicable, or that he will hold the draw open.

(ii) Danger signals. Shall consist of a series of short blasts, at least four, given in rapid succession, and repeated if necessary, or a red flag during the day or a red light at night swung in full circles in full sight of the vessel. The signals will be used in answering the call signal of a vessel to indicate that the draw cannot or will not be opened at once, or, when vessels are waiting in the vicinity, that the draw, if open is about to be closed. It is also to be used in emergency to revoke an acknowledging signal.

(iii) Rescinding signals. Shall be the reverse of the call signal for each bridge. The signal will be used by a vessel to cancel a previous call signal, and to indicate

that the vessel does not intend to pass through and that the draw need not be opened, or may be closed.

(iv) Answer by the bridge tender to a rescinding signal shall be the danger signal.

NOTE: The term "long blast" means a distinct blast of approximately five seconds' duration and the term "short blast" means a distinct blast of approximately two seconds' duration. Visual signals are to be used in conjunction with sound signals when conditions are such that sound signals may not be heard.

(e) All bridges to which the regulations of this section apply shall be equipped with a whistle or horn of sufficient size and range that signals sounded on same shall be distinctly audible up and down stream on a still day for a distance of approximately 2.5 miles.

(f) A vessel, desiring to pass through any of the above bridges, under which it cannot pass with the draw closed, except when advance notice is required by paragraph (c) of this section, shall sound the call signal for such bridge as prescribed and shall repeat such signal at intervals until it is answered by the draw tender. In case two vessels approaching from opposite directions would meet at or near the bridge, the vessel bound downstream shall be considered as having the right of way. When either vessel waits for the passage of the other, the vessel shall again give the call signal for the bridge and receive an acknowledging signal from the draw tender before proceeding. It is incumbent upon navigators to make sure that their signals are understood before proceeding through a drawspan, and when approaching bridges, vessels should be kept under control, with a view to stopping, if necessary, before reaching the bridge.

(g) All vessels when passing any bridge shall be moved as expeditiously as is consistent with safe navigation, and all towboats engaged in towing barges or other craft through any of the bridges shall be of sufficient power to handle the tow without unduly delaying the closing of the drawspan.

(h) Vessels with hinged or adjustable masts or booms projecting above their fixed structure shall lower the same and pass under the bridges, if practicable, without signaling for the draw to open.

(i) If the bridge can be opened, or is already open, when a call signal is given, the draw tender shall promptly answer the vessel calling by giving the acknowledging signal and promptly open the draw or hold it open as the case may be, except that the opening of the draw may be delayed until immediately after the passage of any train which will cross the bridge before stopping and which has passed any bridge signal block located not more than two miles from the bridge. Trains shall in no event stand in such location as to prevent operation of the draw when a vessel desiring passage through the bridge has signaled for the draw to be opened.

(j) In case the draw cannot be opened at once when the call signal is given, the draw tender shall promptly answer the vessel calling by giving the danger signal and shall repeat the same, if necessary. As soon as the exigency which prevented opening has been removed the bridge tender shall promptly sound the regular acknowledging signal for the bridge to advise vessels that the draw can be opened at once, and he shall thereupon proceed to open same if there is a vessel waiting to pass through.

(k) When two vessels arrive at a bridge at or near the same time and blow the call signal, the lift span, when opened, shall be raised high enough to clear the taller vessel. If either vessel at any drawbridge waits for passage of the other and again gives the call signal, the bridge tender shall promptly answer with the acknowledging signal and shall hold the span open. In case the intentions of a waiting vessel are not fully understood by a draw tender, when the draw is open he shall sound the danger signal as a warning to vessels that he is about to close the draw.

(l) If a rescinding signal is given by a vessel to cancel a previously given call signal, and it is evident the vessel does not intend to pass through, the draw tender shall answer with the danger signal and may close the draw, or need not open the draw.

§ 203.765 Cowlitz and Lewis Rivers, Wash.; bridges. (a) General regulations. (1) The corporations or persons owning or controlling a drawbridge shall provide the same with the necessary tenders and the proper mechanical devices for the safe, prompt, and efficient opening of the draw for the passage of vessels.

(2) If the weather conditions are good and sound signals can be heard, when a vessel approaches a drawbridge and desires to pass through the draw:

(i) The person in charge of such vessel desiring to pass shall cause to be sounded, within reasonable hearing distance of the bridge, repeating if necessary, and in time to give due notice to its operator, three long distinct blasts of a whistle, horn, or megaphone, or three loud and distinct strokes of a bell.

NOTE: As used in this section the term long blast of a whistle or horn shall mean a blast of 4 seconds' duration and a short blast shall mean one of 1 second duration.

(ii) When the draw of the bridge can be opened immediately, the draw tender shall reply by two long blasts followed by one short distinct blast of a whistle, horn, or megaphone, or by three loud and distinct strokes of a bell.

(iii) When the draw of the bridge cannot be opened immediately the draw tender shall reply by two long distinct blasts of a whistle, horn, or megaphone, or two distinct strokes of a bell. (This signal may also be used by a vessel to countermand its signal to open draw.)

(iv) When, after a delay, as in subparagraph (2)(iii) of this paragraph, the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal described in subparagraph (2)(iii) of this paragraph, viz, two long blasts followed by one short distinct blast of a whistle, horn, or megaphone, or three loud and distinct strokes of a bell.

(3) When weather conditions prevent hearing sound signals:

(i) The person in charge of a vessel desiring to pass shall swing a white lighted lantern or white flag, the former by night, the latter by day; the person signaling to face the drawbridge and swing the lantern or flag in front of him at arm's length, in vertical circles.

(ii) When the draw of the bridge can be opened immediately, the draw tender shall reply by raising and lowering a white lighted lantern or a white flag, the former by night, the latter by day, the movement to be vertical.

(iii) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by swinging a red lighted lantern or red flag, the former by night, the latter by day; the person signaling to face the vessel and swing the lantern or flag in front of him at arm's length in vertical circles. (This signal may also be used by a vessel to countermand its signal to open draw.)

(iv) When, after a delay, as in subparagraph (3) (iii) of this paragraph the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal described in subparagraph (3) (ii) of this paragraph viz, raising and lowering a lighted lantern or a flag.

(4) When fog prevails by day or by night the draw tender on giving signal (subparagraphs (2) (ii), (2) (iv), (3) (ii), and (3) (iv) of this paragraph) that draw will be opened, shall toll a bell continuously during the approach and passage of the vessel.

(5) The draw shall be opened with the least possible delay upon receiving the prescribed signal: Provided, That the drawspan shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the operator of the drawspan.

(6) Trains, wagons, and other vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall water craft or vessels be so manipulated as to hinder or delay the operation of a drawspan, but all passage over, through, or under a drawbridge shall be prompt, to prevent delay to either land or water traffic.

(7) This paragraph shall apply in the cases of all bridges, but to provide for intermittent attendance of bridge tenders on bridges across streams where water traffic is minor, or at times non-existent, the special regulations and exceptions in paragraph (b) of this section are prescribed.

(b) Special regulations—(1) Northern Pacific Railway Company bridge across Lewis River. (i) The owner of or agency controlling the bridge will not be required to open the draw of the bridge for the passage of vessels from January 1 to May 24, inclusive, and from July 21 to December 31, inclusive, of any year.

(ii) Whenever a vessel unable to pass under the closed bridge desires to pass through the draw from May 25 to July 20, both dates inclusive, at least 6 hours' advance notice of the time the opening is required shall be given to the authorized representative of the owner of or agency controlling the bridge.

(iii) Upon receipt of such notice, the authorized representative of the owner of or agency controlling the bridge, in compliance therewith, shall arrange for the prompt opening of the draw at the time specified in the notice of the passage of the vessel.

(iv) The owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides of the bridge, in a manner that it can be easily read at any time, a copy of the regulations of this section, together with a notice stating exactly how the authorized representative may be reached by telephone or otherwise.

(2) Cowlitz River; highway bridge at Allen Street, Kelso, Wash.

(i) The owner of or agency controlling the drawbridge will not be required to keep a draw tender in constant attendance.

(ii) Whenever a vessel unable to pass under the closed bridge desires to pass through the draw, at least 2 hours' advance notice of the time the opening is required shall be given to the authorized representative of the owner of or agency controlling the bridge. In the event a vessel is delayed by weather conditions or otherwise, the operator will remain a reasonable time, not to exceed two hours, and open the bridge on signal for the passage of the vessel. If a vessel is expected to be delayed more than two hours the operator will be so advised, and notified of the later time the opening will be required.

(iii) Upon receipt of advance notice the authorized representative of the owner of or agency controlling the bridge, in compliance therewith, shall arrange for the prompt opening of the draw at the time specified in the notice for the passage of the vessel. If a vessel passing through the bridge intends to return through within two hours the bridge tender will be advised of the fact and he will remain at and open the bridge upon signal for the vessel's return passage.

(iv) The owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides of the bridge, in a manner that it can be easily read at any time, a copy of these regulations, together with a notice stating exactly how the authorized representative may be reached by telephone or otherwise.

(v) The operating machinery of the draw shall be maintained in a serviceable condition and the draw opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

§ 203.770 Willapa Harbor and navigable tributaries, Washington; bridges. (a) General regulations. (1) The corporations or persons owning or controlling a drawbridge shall provide the same with the necessary tenders and the proper mechanical devices for the safe, prompt, and efficient opening of the draw for the passage of vessels.

(2) The person in charge of a vessel desiring to pass

shall cause to be sounded, within reasonable hearing distance of the bridge, repeating if necessary, and in time to give due notice to its operator, the proper signal for the bridge, as described in paragraph (b) of this section.

(3) When the draw of the bridge can be opened immediately, the draw tender shall reply by one long distinct blast, followed by one short distinct blast of a horn or whistle.

NOTE: As used in this section, a long blast of a horn or whistle shall mean a blast of 4 seconds duration, and a short blast shall mean one of 1 second duration.

(4) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by four short distinct blasts of a horn or whistle. (This signal may also be used by a vessel to countermand its signal to open the draw.)

(5) Trains and other vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening nor shall watercraft or vessels be so manipulated as to hinder or delay the operation of a drawspan, but all passage over, through, or under the drawbridge shall be prompt to prevent delay to either land or water traffic.

(b) Special regulations. (1) The following signals are prescribed for vessels wishing to have the draws opened:

(i) Washington State highway bridge, North Fork, Willapa River at Raymond, Washington: One long blast of horn or whistle followed quickly by one short blast and one long blast.

(ii) Northern Pacific Railroad bridge, South Fork, Willapa River at Raymond, Washington: Two long blasts of a horn or whistle, followed quickly by one short blast.

(iii) Washington State highway bridge, South Fork, Willapa River at Raymond, Washington: Two long blasts of a horn or whistle followed quickly by two short blasts.

(iv) Washington State highway bridge, Naselle River, about 6 miles downstream from Naselle, Washington: one long blast of a horn or whistle.

(2) Constant attendance by draw tenders is not required at the State highway bridges across the North and South Forks of Willapa River at Raymond and the Naselle River about 6 miles downstream from Naselle. Vessels requiring openings of these bridges shall give advance notice of not more than 2 hours for openings between 8:00 a.m. and 5:00 p.m. on all days except Saturdays, Sundays and legal holidays, and advance notice of not more than 8 hours for openings at any other time. The owner of the bridges shall keep conspicuously posted on both the upstream and downstream sides, in such a manner that they can be easily read at any time, copies of the regulations of this section, together with notices stating exactly how the bridge operators may be reached to obtain openings of the bridges, including names, addresses, and telephone numbers.

§ 203.775 Grays Harbor and tributaries, Wash.; bridges. (a) General regulations. (1) The corporations or persons owning or controlling a drawbridge shall provide the same with the necessary tenders and the proper mechanical devices for the safe, prompt, and efficient opening of the draw for the passage of vessels.

691-231 O—63——4

(2) If the weather conditions are good and sound signals can be heard when a vessel approaches a drawbridge and desires to pass through the draw:

(i) The person in charge of such vessel desiring to pass shall cause to be sounded, within reasonable hearing distance of the bridge, repeating if necessary, and in time to give due notice to its operator, three long distinct blasts of a whistle, horn, or megaphone, or three loud and distinct strokes of a bell.

NOTE: As used in this section, the term long blast of a whistle or horn shall mean a blast of 4 seconds duration, and a short blast shall mean one of 1 second duration.

(ii) When the draw of the bridge can be opened immediately the draw tender shall reply by two long blasts followed by one short distinct blast of a whistle, horn, or megaphone, or by three loud and distinct strokes of a bell.

(iii) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by two long distinct blasts of a whistle, horn, or megaphone, or two distinct strokes of a bell. (This signal may also be used by a vessel to countermand its signal to open draw.)

(iv) When, after a delay as in subparagraph (2)(iii) of this paragraph, the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal described in subparagraph (2)(ii) of this paragraph, viz, two long blasts followed by one short distinct blast of a whistle, horn, or megaphone, or three loud and distinct strokes of a bell.

(3) When weather conditions prevent hearing sound signals:

(i) The person in charge of a vessel desiring to pass shall swing a white lighted lantern or white flag, the former by night, the latter by day; the person signaling to face the drawbridge and swing the lantern or flag in front of him at arm's length, in vertical circles.

(ii) When the draw of the bridge can be opened immediately, the draw tender shall reply by raising and lowering a white lighted lantern or a white flag, the former by night, the latter by day; the movement to be vertical.

(iii) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by swinging a red lighted lantern or red flag, the former by night, the latter by day; the person signaling to face the vessel and swing the lantern or flag in front of him at arm's length, in vertical circles. (This signal may also be used by a vessel to countermand its signal to open draw.)

(iv) When, after a delay, as in subparagraph (3)(iii) of this paragraph, the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal described in subparagraph (3)(ii) of this paragraph, viz, raising or lowering a lighted lantern or a flag.

(4) When fog prevails by day or by night the draw tender on giving signal (subparagraphs (2)(ii), (2)(iv), (3)(ii), or (3)(iv) of this paragraph) that draw will be opened, shall toll a bell continuously during the approach and passage of the vessel.

(5) The draw shall be opened with the least possible delay upon receiving the prescribed signal: Provided, That the drawspan shall not be opened when a train is

approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the operator of the drawspan.

(6) Trains, wagons, and other vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall water craft or vessels be so manipulated as to hinder or delay the operation of a drawspan, but all passage over, through, or under a drawbridge shall be prompt to prevent delay to either land or water traffic.

(7) This paragraph shall apply in the cases of all bridges, but to provide for distinctive signals given by vessels to particular bridges, as where two or more are within sight or hearing and but one bridge is desired to be opened, the special regulations and exceptions in paragraph (b) are prescribed.

(b) Special regulations.

(1) State bridge over Hoquiam River at Simpson Avenue: two long blasts of whistle followed quickly by one short blast of whistle.

(2) City bridge over Hoquiam River, Eighth Street, Hoquiam: two long blasts of whistle followed quickly by two short blasts.

(3) Northern Pacific Railway bridge over Hoquiam River near forks of river: one long blast of whistle followed quickly by one short and one long blast.

(4) Northern Pacific Railway bridge over Wishkah River at Aberdeen: one long blast of whistle followed quickly by one short blast.

(5) City bridge over Wishkah River at Heron Street, Aberdeen: one long blast of whistle followed quickly by two short blasts.

(6) City bridge over Wishkah River at Wishkah Street: One long blast of whistle followed quickly by three short blasts.

(7) City bridge over Wishkah River at Second Street, Aberdeen: One long blast of whistle followed quickly by four short blasts.

NOTE: For other special regulations governing operation of this bridge, see § 203.810.

(8) State Highway bridge over Chehalis River at Aberdeen: Two short blasts of whistle followed quickly by one long blast.

§ 203.784 Hood Canal, Wash.; Washington State Department of Highways bridge near Port Gamble. (a) The owner of or agency controlling the bridge will not be required to keep a draw tender in constant attendance, except as otherwise provided in paragraph (b) (3) of this section.

(b) Whenever a vessel is unable to safely pass under either of the two fixed approach spans and desires to pass through the draw of the bridge, at least one hour advance notice of the time of required opening shall be given to the authorized representative of the owner of or agency controlling the bridge by any of the methods indicated below.

(1) Telephone requests for bridge opening will be directed as collect calls to the Toll Office at the bridge site. The call may also be made by direct telephone communication, through the Seattle Marine Operator, Station KOW, or thorugh other marine wire or radio telephone service.

(2) Audio requests for watercraft without facilities as set forth in subparagraph (1) of this paragraph will be made by sounding one long blast of a horn or whistle followed quickly by two short blasts in the immediate vicinity of the drawspan. The bridge attendant will acknowledge by repeating the signal.

(3) During unusual or emergency periods, the authorized representative of the owner of or agency controlling the bridge will be required to operate the draw of the bridge on a demand basis for specified periods of time, which will normally not exceed 48 hours, when requested by the Department of the Navy. While on a demand basis the draw tender will be in attendance on the bridge with radio communications equipment in operation.

(c) After receipt of proper advance notice of a required opening of the drawspan the authorized representative of the owner of or agency controlling the bridge shall arrange for opening the span at the specified time. When opening of the bridge is imminent, all signals, radio or audio, will be promptly acknowledged by both the bridge and vessels desiring to pass through the draw.

(d) Communication when opening is imminent:

(1) Radio: The draw tender will monitor radio telephone frequency 2738 kilocycles and will communicate with vessels on the frequency regarding the intended opening. In the event that radio contact cannot be made on frequency 2738 kilocycles, an attempt will then be made on 2182 kilocycles.

(2) Audio: The draw tender will communicate with vessels not equipped with radio telephone or in instances where radio communication is not satisfactory by use of audio signals as follows:

(i) Vessels wishing to have the draw opened will sound one long blast of a horn or whistle followed quickly by two short blasts.

(ii) If the drawspan cannot be opened immediately, or if open and must close immediately, the draw tender will sound four or more short blasts of a horn or whistle, to be repeated at regular intervals until acknowledged.

(e) The owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides of the bridge, in such a manner that it can easily be read at any time, a copy of the regulations in this section.

§ 203.785 City Waterway, Tacoma Harbor, Wash.; bridges. (a) Draw tenders and operating machinery. The owners of or agencies controlling drawbridges shall provide the necessary tenders and the proper mechanical appliances for the safe, prompt, and efficient opening of the draws for the passage of vessels in accordance with the regulations in this section. The operating machinery of the draws shall be maintained in a serviceable condition, and the draws shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

(b) Signals—(1) Sound signals. To be used if weather conditions are such that sound signals can be heard.

(i) Call signals for opening of draw. For the City of Tacoma bridge at South Eleventh Street, three long blasts followed by one short blast, for the Northern Pacific Railway Company bridge at South Fourteenth Street, two long blasts followed by one short blast, and for the Union Pacific Railroad Company bridge near South Fifteenth Street, one long blast followed by one short blast and one long blast, of a whistle, horn, or megaphone, sounded within reasonable hearing distance of the bridge in each case, repeated if necessary, and in time to give due notice to the draw tender.

NOTE: As used in this section, the term "long blast" means a distinct blast of four seconds' duration, and the term "short blast" means a distinct blast of one second's duration.

(ii) Acknowledging signal when draw can be opened immediately (opening signal). Two long blasts followed by one short blast of a whistle, horn or megaphone, or three loud and distinct strokes of a bell.

(iii) Acknowledging signal when draw cannot be opened immediately, or when it is open and must be closed immediately. Two long blasts of a whistle, horn, or megaphone, or two loud and distinct strokes of a bell. (This signal may also be used by a vessel to countermand its call signal.) Thereafter, as soon as the draw can be opened, the draw tender shall sound the opening signal.

(2) Visual signals. To be used if weather conditions are such that sound signals may not be heard.

(i) Call signal for opening of draw. A white flag by day or a white lighted lantern by night, swung in vertical circles at arm's length in full sight of the bridge and facing the draw.

(ii) Acknowledging signal when draw can be opened immediately (opening signal). Same as call signal, to be given in full sight of the vessel.

(iii) Acknowledging signal when draw cannot be opened immediately, or when it is open and must be closed immediately. A red flag by day or a red lighted lantern by night, swung in vertical circles at arm's length in full sight of the vessel. (This signal may also be used by a vessel to countermand its call signal.) Thereafter, as soon as the draw can be opened, the draw tender shall give the opening signal.

(3) Fog signal. When fog prevails by day or by night the draw tender, after giving the opening signal, shall toll a bell continuously during the approach and passage of the vessel.

(c) Prompt opening required except when delayed by train. Except as otherwise provided in paragraph (e) of this section, the draw shall be opened with the least possible delay on receiving the prescribed signal: Provided, That the draw shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the draw tender.

(d) Interference with operation of bridge prohibited. Trains and vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall watercraft be navigated so as to hinder or delay the operation of the draw, but all passage over or through a drawbridge shall be prompt to prevent delay to either land or water traffic.

(e) Special regulations. (1) City of Tacoma bridge at South Eleventh Street. (i) The owner of or agency controlling this bridge need not keep a draw tender in constant attendance.

(ii) Whenever a vessel, unable to pass under the closed bridge, desires to pass through the draw, at least two hours' advance notice of the time the opening is required must be given to the authorized representative of the owner of or agency controlling the bridge to insure prompt opening thereof at the time required.

(iii) On receipt of such advance notice, the authorized representative, in compliance therewith, shall arrange for the prompt opening of the draw on proper signal at approximately the time specified in the notice: Provided, That the draw need not be opened between 6:45 a.m. and 7:45 a.m. and between 3:30 p.m. and 5:30 p.m. except when necessary to prevent disaster to shipping.

(iv) The owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can easily be read at any time, a copy of the regulations in this section pertaining to the bridge together with information as to whom notice should be given when it is desired that the bridge be opened and directions for communicating with such person by telephone or otherwise.

(2) Union Pacific Railroad Company bridge near South Fifteenth Street. The draw of this bridge need not be opened between 7:15 a.m. and 8:00 a.m. and between 4:15 p.m. and 5:00 p.m. except when necessary to prevent disaster to shipping.

§ 203.790 Duwamish waterway at Seattle, Wash.; bridges. (a) General regulations. (1) The corporations or persons owning or controlling a drawbridge shall provide the same with necessary tenders and the proper mechanical devices for the safe, prompt, and efficient opening of the draw for the passage of vessels.

(2) If the weather conditions are good and signals can be heard when a vessel approaches a drawbridge and desires to pass through the draw:

(i) The person in charge of such vessel desiring to pass shall cause to be sounded, within reasonable hearing distance of the bridge, repeating if necessary, and in time to give due notice to its operator, the opening signal prescribed in paragraph (b) of this section for the particular bridge.

(ii) When the draw of the bridge can be opened immediately, the draw tender shall reply by the signal prescribed under special regulations in paragraph (b) of this section. As used in this section, the term long blast of a whistle or horn shall mean a blast of 4 seconds' duration, and a short blast shall mean one of 1 second duration.

(iii) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by the signal

prescribed under special regulations in paragraph (b) of this section.

(iv) When, after a delay, as in subparagraph (2)(iii) of this paragraph, the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal prescribed under special regulations in paragraph (b) of this section.

(3) When weather conditions prevent hearing sound signals:

(i) The person in charge of a vessel desiring to pass shall swing a white lighted lantern or white flag, the former by night, the latter by day; the person signaling to face the drawbridge and swing the lantern or flag in front of him at arm's length in vertical circles.

(ii) When the draw of the bridge can be opened immediately, the draw tender shall reply by raising and lowering a white lighted lantern or a white flag, the former by night, the latter by day, the movement to be vertical.

(iii) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by swinging a red lighted lantern or red flag, the former by night, the latter by day; the person signaling to face the vessel and swing the lantern or flag in front of him at arm's length in vertical circles. (This signal may also be used by a vessel to countermand its signal to open draw.)

(iv) When, after a delay, as in subparagraph (3)(iii) of this paragraph the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal prescribed in subparagraph (3)(ii) of this paragraph, viz, raising and lowering a lighted lantern or a flag.

(4) When fog prevails by day or by night the draw tender, on giving signal (subparagraphs (2)(ii), (2)(iv), (3)(ii) or (3)(iv) of this paragraph) that draw will be opened, shall toll a bell continuously during the approach and the passage of the vessel.

(5) The draw shall be opened with the least possible delay, upon receiving the prescribed signal: Provided, That the drawspan shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the operator of the drawspan.

(6) Trains, wagons, and other vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall water craft or vessels be so manipulated as to hinder or delay the operation of a drawspan, but all passage over, through, or under a drawbridge shall be prompt, to prevent delay to either land or water traffic.

(b) Special regulations. (1) The general regulations in paragraph (a) of this section shall apply in the cases of all bridges, but to provide for distinctive signals given by vessels to particular bridges, as where two or more are within sight or hearing and but one bridge is desired to be opened, and to provide for closed or open periods when land or water traffic predominates, the special regulations and exceptions in this paragraph are prescribed.

(2) The following signals are prescribed for vessels wishing to have the draws opened:

(i) Northen Pacific Ry. and West Spokane Street Bridge—(a) Opening signal. For the Northern Pacific Ry. bridge only: One long blast of whistle, followed quickly by one short blast. For both the Northern Pacific Ry. and West Spokane Street bridges: One long blast of whistle, followed quickly by three short blasts.

NOTE: Northern Pacific Ry. bridge, clearance 18 feet at mean lower low water; West Spokane Street bridge, clearance 53 feet at mean lower low water.

(b) Closed periods. Between the hours of 7:00 a.m. and 9:00 a.m. and 4:00 p.m. and 6:00 p.m., the draw of the West Spokane Street bridge need not be opened on any day of the week except Saturdays, Sundays and National Holidays for the passage of any vessel of less than 1,000 gross tons unless such vessel has in tow a vessel of 1,000 gross tons or over, or is required to open the bridge to pick up for towing a vessel of 1,000 gross tons or over, except that openings will be made under emergency conditions upon certification to the Seattle City Engineer by responsible representatives of affected navigation interests.

(ii) City bridge at First Avenue South. Clearance 52 feet at mean lower low water.

(a) Opening signal. The signal for opening this bridge shall be three long blasts of the whistle.

(b) Closed periods. Between the hours of 7:00 a.m. and 9:00 a.m., and 4:00 p.m. and 6:00 p.m., the draw of the First Avenue South bridge need not be opened on any day of the week except Saturdays, Sundays and national holidays for the passage of any vessel of less than 1,000 gross tons unless such vessel has in tow a vessel of 1,000 gross tons or over, or is required to open the bridge to pick up for towing a vessel of 1,000 gross tons or over, except that openings will be made under emergency conditions upon certification to the Seattle City Engineer by responsible representatives of affected navigation interests.

(iii) [Reserved]

(iv) County bridge at Fourteenth Avenue South. Clearance 45 feet at mean lower low water.

(a) Opening signal. The signal for opening this bridge shall be one long blast followed quickly by one short blast and one long blast of the whistle.

(b) Closed periods. Between the hours of 7:00 a.m. and 8:00 a.m., and 3:30 p.m. and 5:00 p.m., Monday through Friday of each week, the draw need not be opened for the passage of vessels.

(v) Additional instructions. The bridges described in this subparagraph shall also be opened for the passage of vessels or watercraft of any description propelled by other than steam power, upon like signals given by whistle or trumpet, or upon verbal request of the person or persons in charge of same. If the draw of any of the bridges is ready to be opened immediately when the prescribed signal is given from the vessel, the signal shall be answered immediately by the same prescribed signal from a whistle

or horn on the bridge; but if the draw is not ready to be opened immediately upon the prescribed signal being given on the vessel, the signal shall be answered immediately from the bridge by four or more short blasts of a whistle, horn, or megaphone, or four or more distinct strokes of a bell.

(3) All vessels when passing any bridge shall be moved as expeditiously as is consistent with established rules governing speed in the Duwamish Waterway.

(4) All vessels, crafts, or rafts, not self-propelled, navigating the Duwamish Waterway, for which the opening of any bridge may be necessary, shall while passing such bridge, be towed by a suitable self-propelled boat.

(5) When the draw of any of the bridges listed in this subparagraph shall have been opened for 10 minutes, or for such shorter period as may have been necessary for the passage of vessels or other watercraft desiring to pass, it shall be closed for the crossing of trains, cars, vehicles, or individuals, if any be waiting to cross, and after being so closed for 10 minutes, or for such shorter time as may be necessary for the said trains, cars, vehicles, or individuals to cross, it shall again be opened promptly for the passage of vessels or other watercraft, if there be any such desiring, and authorized hereinabove, to pass at such time.

§ 203.795 Lake Washington Ship Canal, Wash.; bridge. (a) General regulations. (1) The corporations or persons owning or controlling a drawbridge shall provide same with the necessary tenders and the proper mechanical devices for the safe, prompt, and efficient opening of the draw for the passage of vessels.

(2) If the weather conditions are good and sound signals can be heard when a vessel approaches a drawbridge and desires to pass through the draw:

(i) The person in charge of such vessel desiring to pass shall cause to be sounded, within reasonable hearing distance of the bridge, repeating if necessary, and in time to give due notice to its operator, the opening signal prescribed under paragraph (b)(1) of this section for the particular bridge.

(ii) When the draw of the bridge can be opened immediately, the draw tender shall reply by the signal prescribed under paragraph (b)(1) of this section.

As used in this section, the term long blast of a whistle or horn shall mean a blast of 4 seconds duration, and a short blast shall mean one of 1 second duration.

(iii) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by the signal prescribed under paragraph (b)(1) of this section.

(iv) When, after a delay, as in subdivision (iii) of this subparagraph, the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal prescribed under paragraph (b)(1) of this section.

(3) When weather conditions prevent hearing sound signals:

(i) The person in charge of a vessel desiring to pass shall swing a white lighted lantern or white flag, the former by night, the latter by day, the person signaling to face the drawbridge and swing the lantern or flag in front of him at arm's length, in vertical circles.

(ii) When the draw of the bridge can be opened immediately, the draw tender shall reply by raising and lowering a white lighted lantern or a white flag, the former by night, the latter by day, the movement to be vertical.

(iii) When the draw of the bridge cannot be opened immediately, the draw tender shall reply by swinging a red lighted lantern or red flag, the former by night, the latter by day, the person signaling to face the vessel and swing the lantern or flag in front of him at arm's length, in vertical circles. (This signal may also be used by a vessel to countermand its signal to open draw.)

(iv) When, after a delay, as in subparagraph (3)(iii) of this paragraph, the draw of the bridge can be opened and the vessel still desires to pass, the draw tender shall give the signal prescribed in subparagraph (3)(ii) of this paragraph viz, raising and lowering a lighted lantern or a flag.

(4) When fog prevails by day or by night the draw tender on giving signal (subparagraph (2)(ii), (2)(iv), (3)(ii), or (3)(iv) of this paragraph) that draw will be opened, shall toll a bell continuously during the approach and passage of the vessel.

(5) The draw shall be opened with the least possible delay, upon receiving the prescribed signal: Provided, That the drawspan shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the operator of the drawspan.

(6) Trains, wagons, and other vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, nor shall watercraft or vessels be so manipulated as to hinder or delay the operation of a drawspan, but all passage over, through, or under a drawbridge shall be prompt, to prevent delay to either land or water traffic.

(7) This paragraph shall apply in the cases of all bridges, but to provide for distinctive signals given by vessels to particular bridges, as where two or more are within sight or hearing and but one bridge is desired to be opened, and to provide for closed or open periods when land or water traffic predominates, the special regulations and exceptions in paragraph (b) of this section are prescribed.

(b) Special regulations. (1) The following signals are prescribed for vessels wishing to have the draws opened:

(i) Great Northern Railway bridge, clearance 42 feet at high tide. One long blast of whistle, followed quickly by one short blast.

(ii) Ballard Bridge, clearance 45 feet. One long blast of whistle, followed quickly by one short blast.

(iii) Northern Pacific Railway bridge, clearance 16 feet. One long blast of whistle, followed quickly by three short blasts.

(iv) Fremont Avenue Bridge, clearance 30 feet. One long blast of whistle, followed quickly by one short blast.

(v) University Bridge, clearance 44 feet. One long

blast of whistle, followed quickly by three short blasts.

(vi) Montlake Bridge, clearance 46 feet. One long blast of whistle, followed quickly by one short blast.

The bridges listed in subparagraph (1) of this paragraph shall also be opened for the passage of vessels or watercraft of any description propelled by other than steam power, upon like signals given by whistle or trumpet, or upon verbal request of the person or persons in charge of same. If the draw of any of the bridges listed in this subparagraph is ready to be opened immediately when the prescribed signal is given from the vessel, the signal shall be answered immediately by the same prescribed signal from a whistle or horn on the bridge; but if the draw is not ready to be opened immediately upon the prescribed signal being given on the vessel, the signal shall be answered immediately from the bridge by four or more short blasts of a whistle, horn, or megaphone or four or more distinct strokes of a bell.

(2) All vessels when passing any bridge shall be moved as expeditiously as is consistent with established rules governing speed in the Lake Washington Ship Canal.

(3) All vessels, crafts, or rafts, not self-propelled, navigating the Lake Washington Ship Canal, for which the opening of any bridge may be necessary, shall, while passing such bridge, be towed by a suitable self-propelled boat.

(4) The draws in each and every bridge shall, upon the signal prescribed above being given, be opened promptly for the passage of any vessel, or vessels, or other watercraft not able to pass underneath it:

(i) Provided, That the Ballard bridge, Fremont Avenue bridge, University bridge, and Montlake bridge will not be required to open on any day of the week except on Saturdays, Sundays and national holidays between the hours of 7:00 a.m. and 9:00 a.m. and 4:00 p.m. and 6:00 p.m. for vessels or other watercraft of less than 1,000 gross tons unless such vessel has in tow a vessel of 1,000 gross tons or over, or is required to open the bridge to pick up for towing a vessel of 1,000 gross tons or over, except that openings will be made under emergency conditions upon certification of the Seattle City Engineer by responsible representatives of affected navigation interests, and

(ii) Provided further, That the draw in any of the above four city bridges need not be opened at any time for the passage of any vessel of less than 300 gross tons equipped with a movable stack or mast which can readily be lowered so as to permit its passage under the closed draw, unless it has in tow a vessel which is unable to pass under the closed draw. Any vessel of less than 300 gross tons regularly navigating the canal shall be subject to inspection and measurement by the district engineer, United States Engineer Department at Large, in charge of the locality, and said district engineer is hereby empowered to decide in each case whether or not the vessel shall be equipped with hinged or movable stacks, masts and flagpoles which can be lowered to enable the vessel to pass under the closed draw of any or all the bridges. If the district engineer decides that such action should be taken, he shall notify the vessel owner and the bridge owner of his decision, specifying a reasonable time for making the alterations; and after the expiration of the time specified the draw need not be opened for the passage of such vessel unless it has in tow a vessel unable to pass under the closed draw; and

(iii) Provided further, That when the draw in any of the above bridges shall have been opened for 10 minutes, or for such shorter period as may have been necessary for the passage of vessels, or other watercraft, desiring to pass, it shall be closed for the crossing of trains, cars, vehicles, or individuals, if any be waiting to cross, and after being so closed for 10 minutes, or for such shorter time as may be necessary for the said trains, cars, vehicles, or individuals to cross, it shall again be opened promptly for the passage of vessels or other watercraft, if there be any such desiring and authorized hereinabove, to pass at such time.

§ 203.800 Lake Washington, Wash.; pontoon bridge between Seattle and Mercer Island, Wash. (a) The owners of or agencies controlling the drawbridge shall provide the appliances and personnel necessary for the safe, prompt, and efficient operation of the draw.

(b) Signals. (1) Call signals for opening of draw—(i) Sound signal. One long blast followed by one short blast of whistle, horn, or megaphone, sounded within a reasonable distance of the bridge. As used in the regulations in this section long blast shall mean a blast of four seconds duration, short blast shall means one of one second duration.

(ii) Visual signal. To be used in conjunction with sound signals when conditions prevent sound signals being heard. A white flag by day, a white light by night, swung in full vertical circles at arm's length in full sight of the bridge and facing the draw.

(2) Acknowledging signals—(i) By bridge operator—(a) Sound signals. Draw to be opened immediately: Same as call signal. Draw cannot be opened immediately, or, if open, must be closed immediately: Four or more short blasts of a whistle, horn or megaphone or four or more loud and distinct strokes of a bell, to be repeated at regular intervals until acknowledged by the vessel.

(b) Visual signals. To be used in conjunction with sound signals when conditions prevent sound signals being heard. Draw to be opened immediately: A white flag by day, a white light by night swung up and down vertically a number of times in full sight of the vessel. Draw cannot be opened immediately: A red flag by day, a red light by night swung in full vertical circles at arm's length facing the vessel.

(ii) By the vessel. Vessels or other watercraft having signaled for opening of the draw and having received a signal that the draw cannot be opened immediately, shall acknowledge said signal by four or more short blasts or by swinging in full vertical circles at arm's length a red flag by day or a red light by night.

(c) Automobiles, trucks, or other vehicles shall not be stopped on the draw of the bridge, except in cases of urgent necessity, nor shall vessels or other watercraft be manipulated in a manner hindering or delaying the opera-

tion of the draw. All passage over the draw or through the draw opening shall be prompt, in order to prevent delay to either land or water traffic.

(d) All vessels, craft, or rafts, not self-propelled, navigating Lake Washington, for which the opening of the bridge may be necessary, shall, while passing the bridge, be towed by a suitable self-propelled boat.

(e) Upon the signal prescribed in paragraph (b) of this section being given, the draw shall be opened promptly for the passage of any vessel, or vessels, or other water craft not able to pass through the openings under the fixed spans of the pontoon bridge near each shore, or under the spans of the fixed bridge on the east side of Mercer Island:

(1) Provided, That the bridge will not be required to open on any day of the week between the hours of 7:00 a.m. and 9:00 a.m. and 4:00 p.m. and 6:00 p.m for any vessel or other watercraft of less than 2,000 gross tons, unless such vessel has in tow a vessel of 2,000 gross tons or over, or a piledriver that is unable to pass under the fixed spans, and

(2) Provided further, That the bridge need not be opened at any time for the passage of any vessel of less than 300 gross tons equipped with a movable stack or mast which can readily be lowered so as to permit its passage under the fixed spans, unless it has in tow a vessel which is unable to pass under the fixed spans Any vessel of less than 300 gross tons regularly navigating the lake shall be subject to inspection and measurement by the District Engineer, United States Engineer Department at Large, in charge of the locality, and said District Engineer is hereby empowered to decide in each case whether or not the vessel shall be equipped with hinged or movable stacks, masts and flagpoles which can be lowered to enable the vessel to pass under the fixed spans. If the District Engineer decides that such action should be taken, he shall notify the vessel owner and the bridge owner of his decision, specifying a reasonable time for making the alterations; and after the expiration of the time specified, the draw need not be opened for the passage of such vessel unless it has in tow a vessel unable to pass under the fixed spans; and

(3) Provided further, That the bridge will not be required to be opened at any time for any craft towing logs or scows, after the owners of the bridge shall have provided fenders, approved by the Department of the Army, at the openings under the approach span of the pontoon bridge, adjacent to Mercer Island, and under the main span of the fixed bridge between Mercer Island and the mainland east of Lake Washington, unless such craft cannot pass under those spans; and

(4) Provided further, That when the draw shall have been opened for ten minutes, or for such shorter period as may have been necessary for the passage of vessels, or other watercraft, desiring to pass, it shall be closed for the crossing of vehicles or individuals, if any be waiting to cross, and after being so closed for ten minutes, or for such shorter time as may be necessary for the said vehicles or individuals to cross, it shall again be opened promptly for the passage of vessels or other watercraft, if there be any such desiring, and authorized herein, to pass at such time; and

(5) Provided further, That, at night, between the hours of 9 p.m. and 5 a.m., the draw shall be opened for the passage of all vessels that cannot pass under the fixed spans upon notice given by telephone or otherwise to the bridge operator at least 30 minutes in advance of the time that the vessel desires to pass through the draw.

(f) [Reserved]

(g) The owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides of the bridge, in such a manner that it can be easily read at any time, a copy of the regulations in this section, together with a notice stating exactly how the bridge operator specified in paragraph (e) of this section may be reached.

§ 203.805 Snohomish River, Steamboat Slough, and Ebey Slough, Wash.; bridges. (a) Draw tenders and operating machinery. The owners of or agencies controlling drawbridges shall provide the necessary tenders and the proper mechanical appliances for the safe, prompt, and efficient opening of the draws for the passage of vessels in accordance with the regulations in this section. The operating machinery of the draws shall be maintained in a serviceable condition, and the draws shall be opened and closed at intervals frequent enough to make certain that the machinery is in proper order for satisfactory operation.

(b) Signals—(1) Sound signals. To be used if weather conditions are such that sound signals can be heard.

(i) Call signal for opening of draw. Three long blasts of a whistle, horn, or megaphone, or three loud and distinct strokes of a bell, sounded within reasonable hearing distance of the bridge repeated if necessary, and in time to give due notice of the draw tender: Provided, That distinctive call signals are prescribed for certain bridges as follows:

Snohomish River; State of Washington Department of Highways bridges near the mouth. Three long blasts followed by one short blast (one signal opens both bridges).

Steamboat Slough; Great Northern Railway Company bridge near the mouth. One long blast followed by one short blast and one long blast.

Steamboat Slough; State of Washington Department of Highways bridges near the mouth. Two long blasts followed by one short blast (one signal opens both bridges).

Ebey Slough; State of Washington Department of Highways bridge near the mouth. Three long blasts followed by one short blast.

NOTE: As used in this section, the term "long blast" means a distinct blast of four seconds' duration, and the term "short blast" means a distinct blast of one second's duration.

(ii) Acknowledging signals—(a) When draw can be

opened immediately (opening signal). Two long blasts followed by one short blast of a whistle, horn, or megaphone, or three loud and distince strokes of a bell.

(b) When draw cannot be opened immediately, or when it is open and must be closed immediately. Two long blasts of a whistle, horn, or megaphone, or two loud and distinct strokes of a bell. (This signal may also be used by a vessel to countermand its call signal.) Thereafter, as soon as the draw can be opened, the draw tender shall sound the opening signal.

(2) Visual signals. To be used if weather conditions are such that sound signals may not be heard.

(i) Call signal for opening of draw. A white flag by day or a white lighted lantern by night, swung in vertical circles at arm's length in full sight of the bridge and facing the draw.

(ii) Acknowledging signal when draw can be opened immediately (opening signal). Same as call signal, to be given in full sight of the vessel.

(iii) Acknowledging signal when draw cannot be opened immediately, or when it is open and must be closed immediately. A red flag by day or a red lighted lantern at night, swung in vertical circles at arm's length in full sight of the vessel. (This signal may also be used by a vessel to countermand its call signal.) Thereafter as soon as the draw can be opened, the draw tender shall give the opening signal.

(3) Fog signal. When fog prevails by day or by night, the draw tender, after giving the opening signal, shall toll a bell continuously during the approach and passage of the vessel.

(c) Prompt opening required except when delayed by train. Except as otherwise provided in paragraph (e) of this section, the draw shall be opened with the least possible delay on receiving the prescribed signal: Provided, That the draw shall not be opened when a train is approaching so closely that it cannot safely be stopped before reaching the bridge, or when a passenger or mail train is approaching within sight or hearing of the draw tender.

(d) Interference with operation of bridge prohibited. Trains and vehicles shall not be stopped on a drawbridge for the purpose of delaying its opening, not shall watercraft be navigated so as to hinder or delay the operation of the draw, but all passage over or through a drawbridge shall be prompt to prevent delay to either land or water traffic.

(e) Bridges where constant attendance of draw tenders is not required. (1) The owners of or agencies controlling the bridges listed in subparagraph (5) of this paragraph need not keep draw tenders in constant attendance.

(2) Whenever a vessel, unable to pass under a closed bridge, desires to pass through the draw, advance notice, as specified, of the time the opening is required must be given to the authorized representative of the owner of or agency controlling the bridge to insure prompt opening thereof at the time required.

(3) On receipt of such advance notice, the authorized representative, in compliance therewith, shall arrange for the prompt opening of the draw on proper signal at approximately the time specified in the notice.

(4) The owners of or agencies controlling each bridge shall keep conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can easily be read at any time, a copy of the regulations in this section pertaining to the bridge together with information as to whom notice should be given when it is desired that the bridge be opened and directions for communicating with such person by telephone or otherwise.

(5) The bridges to which this paragraph applies, and the special regulations applicable in each case, are as follows:

Snohomish River; State of Washington Department of Highways bridges north of Everett, at least 2 hours' advance notice required: Provided, That during freshets a draw tender shall be kept in constant attendance upon order of the District Engineer, Seattle District, Corps of Engineers.

Snohomish River; State of Washington Department of Highways bridge at the foot of Hewitt Avenue, Everett. At least 4 hours' advance notice required: Provided, That during freshets a draw tender shall be kept in constant attendance upon order of the District Engineer, Seattle District, Corps of Engineers.

Snohomish River; bridges of the Northern Pacific Railway Company and the Great Northern Railway Company at Snohomish. At least 24 hours' advance notice required.

Steamboat Slough; bridges of Great Northern Railway Company and State of Washington Department of Highways near Marsyville. At least 4 hours' advance notice required.

§ 203.810 Navigable waters in the State of Washington; bridges where constant attendance of draw tenders is not required. (a) The owners of or agencies controlling the bridges listed in paragraph (f) of this section will not be required to keep draw tenders in constant attendance.

(b) Whenever a vessel unable to pass under a closed bridge desires to pass through the draw, advance notice, as specified, of the time the opening is required must be given to the authorized representative of the owner of or agency controlling the bridge to insure prompt opening thereof at the time required.

(c) On receipt of such advance notice, the authorized representative, in compliance therewith, shall arrange for the prompt opening of the draw on proper signal at approximately the time specified in the notice.

(d) The owner of or agency controlling each bridge shall keep conspicuously posted on both the upstream and downstream sides thereof, in such manner that it can easily be read at any time, a copy of the regulations in this section pertaining to the bridge together with information as to whom notice should be given when it is desired that the bridge be opened and directions for communicating with such person by telephone or otherwise.

(e) The operating machinery of the draws shall be maintained in a serviceable condition, and the draws shall be opened and closed at intervals frequent enough to

make certain that the machinery is in proper order for satisfactory operation.

(f) The bridges to which this section applies, and the regulations applicable in each case, are as follows:

(1) Puyallup Waterway and River, Tacoma Harbor; City of Tacoma highway and street railway bridge at East Eleventh Street, and Chicago, Milwaukee, St. Paul and Pacific Railroad Company bridge near East Eleventh Street. At least four hours' advance notice required .

(2) South Fork, Skagit River, Skagit County highway bridge at Fir. The bridge need not be opened for the passage of vessels, and paragraphs (b) to (e), inclusive, of this section shall not apply to this bridge.

(3) Skagit River; State of Washington Department of Highways bridges and Great Northern Railway Company bridge at and near Mount Vernon. At least 24 hours' advance notice required.

(4) Wishkah River; City of Aberdeen highway bridge at East Second and Young Streets, Aberdeen. Between sunrise and sunset, at least 24 hours' advance notice required. Between sunset and sunrise the draw need not be opened for the passage of vessels.

(5) Wishkah River; City of Aberdeen bridge at Heron Street and State Department of Highways bridge at Wishkah Street, Aberdeen. Between 9:00 p.m. and 5:00 a.m., at least 8 hours' advance notice required: Provided, That the District Engineer, Corps of Engineers, may require the constant attendance of draw tenders during seasonal activity in the logging and fishing industries.

(6) Hoquiam River; State Department of Highways bridge at Simpson Street, Hoquiam. Between 9:00 p.m. and 5:00 a.m., at least 8 hours' advance notice required.

(7) Chehalis River; State Department of Highways and Union Pacific Railroad Company bridges at South Montesano. Between 9:00 p.m. and 5:00 a.m., at least 8 hours' advance notice required: Provided, That during freshets a draw tender shall be kept in constant attendance upon the order of the District Engineer, Corps of Engineers.

(8) Snake River; Union Pacific Railroad Company bridge at Riparia, and Idaho-Washington Department of Highway bridge at Clarkston. The draws need not be opened for the passage of vessels, and paragraphs (b) to (e), inclusive, of this section shall not apply to these bridges.

§ 203.815 Pend Oreille Lake, Idaho; bridge of Northern Pacific Railway Company near Sandpoint. (a) The owner of or agency controlling the bridge will not be required to keep a draw tender in constant attendance.

(b) Whenever a vessel, unable to pass under the closed bridge, desires to pass through the draw, at least 36 hours' advance notice of the time the opening is required shall be given to the authorized representative of the owner of or agency controlling the bridge.

(c) Upon receipt of such notice, the authorized representative of the owner of or agency controlling the bridge, in compliance therewith, shall arrange for the prompt opening of the draw at the time specified in the notice for the passage of the vessel.

(d) The owner of or agency controlling the bridge shall keep conspicuously posted on both the upstream and downstream sides of the bridge, in such manner that it can easily be read at any time, a copy of the regulations in this section together with a notice stating exactly how the representative specified in paragraph (b) of this section may be reached.

(e) The operating machinery of the draw shall be maintained in a serviceable condition and the draw opened and closed at intervals frequent enough to assure that the machinery is in proper order for satisfactory operation.

§ 203.900 Honolulu Harbor, Hawaii; Kalihi Channel bridge. (a) The agencies controlling the bridge shall provide the necessary bridge tenders and the proper mechanical appliances for the safe, prompt and efficient opening of the draw for the passage of vessels during the scheduled hours of operation as follows:

Monday Through Friday, Except Legal Holidays

Open on signal	Closed periods
5:00 a.m. to 7:00 a.m.	7:00 a.m. to 8:00 a.m.
8:00 a.m. to 4:00 p.m.	4:00 p.m. to 5:00 p.m.
5:00 p.m. to 7:00 p.m	7:00 p.m. to 5:00 a.m.

(b) From 5:00 a.m. on Saturdays to 5:00 a.m. on Mondays and on legal holidays, the bridge will be opened for traffic upon six (6) hours' advance notice to the Honolulu Harbor Pilot Station at Aloha Tower. In event of emergencies during the closed periods specified in paragraph (a) of this section, the Pilot Station will be called for clearance. In the event that a seismic sea-wave (tidal wave) is imminent, the bridge shall be opened to full horizontal and vertical clearances a minimum of one (1) hour prior to the reported time of arrival of the wave. The bridge shall remain in the open position until the Harbormaster, Port of Honolulu, declares the port safe for navigation.

(c) When a vessel or other watercraft intends to pass through the draw of the bridge, the master or pilot thereof shall, on approaching within signaling distance, signify his intention to pass through the draw by sounding two (2) long blasts followed immediately by two (2) short blasts. If the draw can be opened immediately, the bridge tender shall reply by one (1) long blast. When the draw cannot be opened immediately, the bridge tender shall sound three (3) long blasts. If for any reason the draw cannot be opened after the tender has signified immediate opening by the one (1) long blast, he shall immediately sound the rescinding signal of three (3) long blasts. As soon as the exigency which prevented opening has been removed, the tender shall promptly sound the regular acknowledging signal of one (1) blast to advise vessels that the draw can be opened at once, and he shall thereupon proceed to open the draw if there is a vessel waiting to pass through. No vessel shall attempt to navigate the draw when audible or visual signals indicate the bridge cannot be opened.

NOTE: As used in this section, the term "long blast" means a distinct blast of a whistle or horn of five (5) seconds duration, and the term "short blast" means a distinct blast of a whistle or horn of one (1) second dura-

tion. The whistle or horn shall be of a size and range to be heard on a still day a minimum of one-half (0.5) mile.

(d) When a vessel approaches the bridge and signals for the opening of the draw, the bridge tender shall reply by means of the prescribed sound signals and, in addition, he shall exhibit the following visual signals:

(1) A flashing green light to indicate that the draw can be opened immediately.

(2) A flashing red light to indicate that the draw cannot be opened immediately, or, being open, is to be closed immediately.

(3) The flashing green light shall be exhibited during the time the draw is opening and until the draw is to be closed.

(4) The flashing red light shall be exhibited during the time the draw is closing.

(5) The flashing red light shall be exhibited and the danger signal sounded if, for reasons of emergency, the bridge tender shall find that the draw cannot be operated for the safe passage of vessels.

(6) The flashing red and green lights shall be mounted on a mast on the bridge control tower at a height of 65 feet above the water plane at mean lower low water datum, shall be visible between 50 degrees and 245 degrees True from seaward and visible for a distance of approximately 3 miles.

(e) Vessels having a length greater than one hundred fifty (150) feet shall not pass through the opened bridge span at the same time going either in the same direction or approaching each other from opposite directions. When vessels having a length less than one hundred fifty (150) feet are approaching from opposite directions to pass through the bridge, each vessel shall give the call signal for opening the draw. The vessel approaching from seaward shall have the right of way. Both vessels shall then be navigated in accordance with the applicable pilot rule.

(f) Clearance gauges of a type to be approved by the District Engineer shall be provided and kept in good legible condition. Unless otherwise specified, such clearance gauges shall consist of two board gauges painted white with black figures not less than nine inches high, which shall indicate the headroom clearances under the closed center of the span at all stages of the tide. These gauges shall be so placed, that they will be plainly visible to the operator of a vessel approaching the bridge either inbound or outbound, and shall be illuminated at night and during periods of decreased visibility caused by heavy rain or mist.

(g) At each opening of the draw full horizontal and vertical clearances shall be provided, regardless of the size or requirements of the passing vessel or other watercraft.

(h) The agencies controlling the bridge shall keep a complete record of all openings of the draw and shall promptly report to the District Engineer all cases in which the drawspan has been required to remain open for an unreasonable length of time or to remain closed for more than 10 minutes after the prescribed signal to open the draw has been given.

(i) The length of time that a draw has been opened shall be computed from the time that the drawspan begins to move in opening, and the length of time that a draw has been closed shall be computed from the time that the drawspan ceases to move in closing.

(j) The bridge shall not be required to open for craft carrying appurtenances unessential to navigation and any vessel operator who causes the bridge to be opened in order to clear appurtenances unessential for navigation shall be considered in violation of the regulations of this section.

(k) Appurtenances unessential for navigation shall include but not be limited to fishing outriggers, radio or television antennae, false stacks, and masts purely for ornamental purposes. Appurtenances unessential to navigation will not include flying bridges, sailboat masts, pile driver leads, spud frames on hydraulic dredges, or other items of equipment clearly necessary to the intended use of the vessel.

(l) The agencies controlling the bridge shall report to the District Engineer the names of any vessels requiring bridge openings considered to be in violation of this section. The District Engineer may at any time cause an inspection to be made of any craft using the waterway and is empowered to decide in each case whether or not the appurtenances are unessential to navigation. If the District Engineer decides a vessel has appurtenances unessential to navigation, he shall notify the vessel owner of his decision, specifying a reasonable time for making the alterations. If the vessel owner is aggrieved by the decision of the District Engineer, he may within 30 days after the receipt of the request to perform necessary alterations, appeal the decision to the District Engineer in writing. After receipt by the District Engineer, the appeal will be forwarded through channels to the Secretary of the Army. If the Secretary of the Army rules that an appurtenance is unessential to navigation, the District Engineer shall again specify to the vessel owner a reasonable time for making necessary alterations to the appurtenance, and after the expiration of the time specified, any operation of the vessel on the waterway in such a manner as to require drawbridge openings shall be deemed in violation of the regulations of this section, unless the necessary alterations shall have been made.

(m) All vessels when passing the bridge shall be moved as expeditiously as is consistent with safe navigation, and all towboats engaged in towing barges or other craft through the bridge shall be of sufficient power to handle the tow without unduly delaying the closing of the drawspan.

(n) Vessels with hinged or adjustable masts or booms projecting above their fixed structure shall lower the same and pass under the bridge, if practicable, without signaling for the draw to open.

(o) Vehicles and pedestrians shall not be stopped on the bridge for the purpose of delaying its opening, nor

shall watercraft be handled so as to hinder or delay the operation of the draw, but all passage over or through the bridge shall be prompt to prevent delay to either land or water traffic.

(p) The operating machinery of the draw shall be maintained in a serviceable condition, and the draw shall be opened and closed at intervals frequent enough to make certain the machinery is in proper order for satisfactory operation.

(q) The term District Engineer as used in this section shall mean the District Engineer, U.S. Army Engineer District, Honolulu.

(r) The agencies controlling the bridge shall keep a legible copy of the regulations in this section posted conspicuously under glass on both the harbor and channel sides of the bridge in such manner that it can be easily read at all times.

PART 204—DANGER ZONE REGULATIONS:

§ 204.195 Anaheim Bay Harbor, Calif.; Naval Weapons Station, Seal Beach. (a) The danger zone. The waters of Anaheim Bay Harbor between the east and west jetties at the United States Naval Weapons Station, Seal Beach, California, and the contiguous tidal channel and basin as far east as the Pacific Electric Railway bridge.

(b) The regulations. (1) Transit shall be prohibited to all but regularly documented vessels and power boats having a certificate of award of number. Sailing vessels shall use auxiliary power in Anaheim Bay proper. Rowboats, canoes, kayaks, etc., are specifically prohibited.

(2) All boats shall proceed as expeditiously as possible by the shortest practicable route through the danger zone. Fishing, landing, and stopping except in actual emergency are specifically prohibited.

(3) The name and address of the owner, and the number, description, color, and size of the craft shall be registered with the enforcing agency.

(4) Passage shall be made only upon the express permission of the enforcing agency (through the Station Duty Officer) in each instance, date and time of expected return to be given. This permission shall be obtained by telephone or otherwise not less than one hour before seaward transit in order that security personnel may be properly notified and to avoid interference with scheduled operations.

(5) To permit identification all passages, except such as are necessitated by stress of weather, shall be made between the beginning of morning twilight and the end of evening twilight. If after evening twilight the boat shall stop at the dock and clear with the Duty Officer (through sentry).

(6) Both entrances to the bay will be suitably posted.

(7) All craft of whatever category shall have the right at any time to seek shelter in these waters because of stress of weather.

(8) This section shall be enforced by the Commanding Officer of the United States Naval Weapons Station, Seal Beach, California, and such agencies as he may designate.

(9) Nothing in this section shall be construed as relieving the owner or person in charge of any vessel or plant from the penalties of the law for obstructing navigation or for obstructing or interfering with range lights, or for not complying with the navigation laws in regard to lights or signals, or for otherwise violating law.

§ 204.197 Pacific Ocean in vicinity of San Pedro, Calif.; practice firing range for United States Army Reserve, National Guard, and Coast Guard units. (a) The danger zone—(1) Zone A. (Revoked.)

(2) Zone B. An area extending southwest and northwest from Point Vicente, described as follows: Beginning at Point Vicente Light, latitude 33°44′30″, longitude 118°24′36″; thence southwesterly to latitude 33°43′42″; longitude 118°25′24″; thence northwesterly to latitude 33°46′30″, longitude 118°27′06″; thence southeasterly to the shore, latitude 33°44′54″, longitude 118°24′42″; and thence southerly along the shore to the point of beginning.

(b) The regulations. (1) Intermittent firing may take place in the danger zone on any day from sunrise to sunset.

(2) Except as otherwise provided in this paragraph, the danger zone will be open to fishing and general navigation. When firing is not scheduled the danger zone may be occupied without restriction. When firing is in progress safety observers will be maintained to warn all vessels. Notice to vacate the area, or to stop at the boundaries, will be given by siren, patrol vessel, or other effective means, and such notice shall be promptly obeyed. All vessels permitted to enter the danger zone during a firing period, other than those owned by and operated by or under the direction of the United States Government, shall proceed across the area by the most direct route and clear the area with the greatest possible dispatch. No vessel, fishing boat, or recreational craft shall anchor in the danger zone during an actual firing period.

(3) Nothing in this section shall be construed as relieving the owner or person in charge of a vessel from any penalties for obstructing navigation, or for obstructing or interfering with range lights, or for not complying with the navigation laws in regard to lights and fog signals, or for otherwise violating any law or regulations.

(4) The regulations in this section shall be enforced by the Commanding Officer, Fort MacArthur, California, and such agencies as he may designate.

§ 204.200 Pacific Ocean at San Clemente Island, Calif.; Navy shore bombardment area in vicinity of Pyramid Cove. (a) The danger zone. Shoreward of a line beginning at White Washed Rock on the beach bearing 199° true, 540 yards, from Pyramid Head Light; thence 160°30′ true, 1.17 nautical miles; thence 243°30′ true, 2.35 nautical miles; and thence 307° true to the beach.

(b) The regulations. (1) This area is used for shore

bombardment by the United States Navy and all vessels shall promptly vacate the area when ordered to do so by the Navy or Coast Guard. Vessels shall not enter the area during periods scheduled for firing as published in local Notice to Mariners.

(2) Except in an emergency, no vessel shall anchor in the area without first obtaining permission from the Commandant, Eleventh Naval District, or from the Senior Officer present in the anchorage who may grant permission to anchor not exceeding the period he himself is authorized to remain there. The Senior Officer present shall advise the Commandant, Eleventh Naval District, when and to whom he assigns a berth.

§ 204.200a Pacific Ocean, San Clemente Island, Calif.; naval danger zone off West Cove. (a) The danger zone. The waters of the Pacific Ocean in an area about one-half mile off the west coast of San Clemente Island basically outlined as follows:

Latitude	Longitude
33°00′40″	118°35′45″
32°57′40″	118°34′25″
32°57′10″	118°35′40″
33°00′10″	118°37′00″
33°00′40″	118°35′45″

(b) The regulations. (1) Intermittent firing may take place in the danger zone on any day from 8:00 a.m. until 1:00 p.m.

(2) Except as otherwise provided in this section, the danger zone will be open to fishing and general navigation.

(3) The operations officer, Naval Ordnance Test Station, Pasadena Annex, Pasadena, California, will announce firing schedules. Each week, public notices will be issued giving advance firing schedules. Such notices will appear in the local newspapers and in local "Notice to Mariners" and "Notice to Airmen." For the benefit of the fishermen and small-craft operators, announcements will be made on the marine radio.

(4) When a scheduled firing is about to be undertaken, fishing boats and other small craft will be contacted by surface patrol boats or aircraft equipped with a loudspeaker system. When so notified, all vessels shall leave the area immediately by the shortest route. Upon completion of firing or if the scheduled firing is cancelled for any reason, fishermen and small-boat operators will be notified as far in advance as possible by Marine Radio Broadcast.

(5) The regulations in this section shall be enforced by security personnel attached to the Naval Ordnance Test Station, Pasadena Annex, and by such agencies as may be designated by the Commandant, Eleventh Naval District, San Diego.

§ 204.201a Pacific Ocean in the vicinity of Point Mugu, Calif.; naval small arms firing range. (a) The danger zone. A triangular area extending westerly into the waters of the Pacific Ocean from a point on the beach north of Point Mugu, California, described as follows: Beginning at latitude 34°05′32″, longitude 119°03′57″; thence southwesterly approximately 4,000 yards to latitude 34°04′22″, longitude 119°05′55″; thence northwesterly approximately 1,500 yards to latitude 34°05′01″, longitude 119°06′17″; thence northeasterly to the point of beginning.

(b) The regulations. (1) Range-firing will normally take place between 6:00 a.m. and 4:30 p.m., Monday through Friday of each week. Within the above period, firing will be conducted when it is determined by the Commanding Officer, U.S. Naval Construction Battalion Center, Port Hueneme, California.

(2) Except as otherwise provided in this section, the danger zone will be open to fishing and general navigation.

(3) The Commanding Officer, U.S. Naval Construction Battalion Center, Port Hueneme, California, will announce firing schedules. Each week, public notices will be issued giving advance firing schedules. Such notices will appear in the local newspapers and in local "Notice to Mariners," and "Notice to Airmen." For the benefit of fishermen and small-craft operators, announcements will be made on the marine radio.

(4) When a scheduled firing is about to be undertaken or is in progress, a large red flag will be displayed from the control tower situated at latitude 35°05′32″, longitude 119°03′57″, so as to be clearly visible for a distance of at least three (3) miles offshore. Safety observers will be on duty at all times when the warning flag is being displayed from the tower. Upon completion of firing, or if the scheduled firing is canceled for any reason, fishermen and small-boat operators will be notified as far in advance as possible by Marine Radio Broadcast.

(5) Vessels or other craft shall not enter or remain in the danger zone when the warning flag is being displayed unless authorized to do so by the range officer in the control tower.

(6) The regulations in this section shall be enforced by the Commandant, Eleventh Naval District, San Diego, California, and such agencies as he may designate.

§ 204.202 Pacific Ocean, Pacific Missile Range, Point Mugu, Calif.; danger zone. (a) The area. (1) The waters of the Pacific Ocean in an area extending seaward from the shoreline a distance of about three nautical miles and basically outlined as follows:

Station	Latitude	Longitude
Point Sal	34°54′08″	120°40′15″
1	34°54′08″	120°44′00″
2	34°52′48″	120°44′00″
3	34°50′00″	120°40′30″
4	34°44′50″	120°42′15″
5	34°41′50″	120°40′12″
6	34°35′12″	120°42′45″
7	34°33′00″	120°41′05″
8	34°30′40″	120°37′29″
9	34°30′40″	120°30′10″
Point Sal	34°54′08″	120°40′15″

(2) The danger area described in subparagraph (1) of this paragraph will be divided into zones in order that

certain firing tests and operations, whose characteristics as to range and reliability permit, may be conducted without requiring complete evacuation of the entire area. These zones are described as follows:

(i) Zone 1. An area extending seaward about three nautical miles from the shore line beginning at latitude 34°30′40″, longitude 120°30′10″; thence due west to latitude 34°30′40″, longitude 120°37′29″; thence due north to the shoreline at latitude 34°33′15″, longitude 120°37′29″.

(ii) Zone 2. An area extending seaward about three nautical miles from the shoreline beginning at latitude 34°33′15″, longitude 120°37′29″; thence due south to latitude 34°30′40″, longitude 120°37′29″; thence to latitude 34°33′00″, longitude 120°41′05″; thence to latitude 34°34′32″, longitude 120°42′30″; thence due east to the shoreline at latitude 34°34′32″, longitude 120°39′03″.

(iii) Zone 3. An area extending seaward about three nautical miles from the shoreline beginning at latitude 34°34′32″, longitude 120°39′03″; thence due west to latitude 34°34′32″, longitude 120°42′15″; thence to latitude 34°35′12″, longitude 120°42′45″; thence to latitude 34°37′15″, longitude 120°41′55″; thence due east to the shoreline at latitude 34°37′15″, longitude 120°38′00″.

(iv) Zone 4. An area extending seaward about three nautical miles from the shoreline beginning at latitude 34°37′15″, longitude 120°38′00″; thence due west to latitude 34°37′15″, longitude 120°41′55″; thence to latitude 34°40′00″, longitude 120°40′50″; thence due east to the shoreline at latitude 34°40′00″, longitude 120°36′45″.

(v) Zone 5. An area extending seaward about three nautical miles from the shoreline beginning at latitude 34°40′00″, longitude 120°36′45″; thence due west to latitude 34°40′00″, longitude 120°40′50″; thence to latitude 34°41′50″, longitude 120°40′12″; thence to latitude 34°44′50″, longitude 120°42′15″; thence to latitude 34°45′28″, longitude 120°42′05″; thence due east to the shoreline at Purisima Point (latitude 34°45′28″, longitude 120°38′15″).

(vi) Zone 6. An area extending seaward about three nautical miles from the shoreline beginning at Purisima Point (latitude 34°45′28″, longitude 120°38′15″); thence due west to latitude 34°45′28″, longitude 120°42′05″; thence to latitude 34°50′00″, longitude 120°40′30″; thence due east to the shoreline at latitude 34°50′00″, longitude 120°36′30″.

(vii) Zone 7. An area extending seaward about three nautical miles from the shoreline beginning at latitude 34°50′00″, longitude 120°36′30″; thence due west to latitude 34°50′00″, longitude 120°40′30″; thence to latitude 34°52′48″, longitude 120°44′00″; thence to latitude 34°54′08″, longitude 120°44′00″; thence due east to Point Sal (latitude 34°54′08″, longitude 120°40′15″).

(viii) Zone 8. An area extending seaward with a radius of three nautical miles centered at Purisima Point (latitude 34°45′28″, longitude 120°38′15″).

(b) The regulations. (1) Except as prescribed in this section or in other regulations, the danger zone will be open to fishing and general navigation without restrictions. Firing between designated hours is expected to be intermittent and, when safe to do so, commercial fishing boats and other small craft will be granted permission to proceed through the danger zones, or to another zone within the area.

(2) The stopping or loitering of vessels is expressly prohibited within a three-mile radius of Purisima Point (Zone 8) unless prior permission is obtained from the Commander, Pacific Missile Range.

(3) The firing of missiles will take place in any one or any group of zones in the danger area at frequent and irregular intervals throughout the year. The Commander, Pacific Missile Range, will announce missile firing schedules. Each week public notices will be issued giving advance firing schedules. Such notices will appear in the local newspapers and in "Notice to Mariners." For the benefit of the fishermen and small-craft operators, announcements will be made on radio frequency 2638 kc. Additionally, information will be posted on notice boards located outside Port Control Offices at Santa Barbara, Port San Luis, and Morro Bay.

(4) When a scheduled firing is about to be undertaken, fishing boats, other small craft, and shipping vessels which are operating in any one of the zones will be contacted by surface patrol boats or aircraft equipped with a loudspeaker system. Broadcasts on 2638 kc. will also be made starting at least 24 hours in advance of firing operations. When so notified, all vessels shall leave the specified zone or zones immediately by the shortest route.

(5) No seaplanes, other than those approved for entry by the Commander, Pacific Missile Range, may enter the danger zone during firing periods.

(6) The regulations in this section shall be enforced by personnel attached to the Pacific Missile Range, Point Mugu, California, and the Naval Missile Facility, Point Arguello, California, and by such agencies as may be designated by the Commandant, Eleventh Naval District, San Diego, California.

(7) The Commander, Pacific Missile Range, will extend full cooperation relating to the public use of the danger area and will fully consider every reasonable request for its use in light of requirements for national security and safety of persons and property.

(8) The regulations in this section shall be in effect for a period of five years from the date they are established unless terminated by the Secretary of the Army at an earlier date.

§ 204.205 Monterey Bay, Calif. (a) Firing range, Fort Ord, Calif.—(1) The danger zone. (i) A rectangular area in Monterey Bay, the southerly limit of which is an extension seaward of the southerly line of the Fort Ord Military Reservation boundary and bears 307° true, 8,000 yards from a point on the shore at latitude 36°37′47″, longitude 121°50′28″, and the northerly limit of which is a line bearing 307° true, 8,000 yards, from a point on the shore at latitude 36°41′57″, longitude 121°48′30″, opposite Marina, Monterey County, California. The seaward boundary is a straight line joining the outer ends

of the southerly and the northerly boundaries at the 8,000 yard range and is approximately parallel to the shore.

(ii) The danger zone is divided into a short range area, extending seaward from the shore a distance of 5,000 yards measured along the southerly and northerly boundaries, and a long range area embracing the entire danger zone.

(2) The regulations. (i) The 5,000 yard short range area is prohibited to all vessels and craft, except those authorized by the enforcing agency, each week, between dawn and midnight from Monday through Friday and between dawn and dusk on Saturday and Sunday.

(ii) The area between the 5,000 yard short range and the 8,000 yard seaward boundary of the danger zone may be used at all times for navigation and fishing, except when advance notice of intention to use this area has been given by the enforcing agency by one or more of the following means.

(a) Notice published in Monterey County and Santa Cruz County daily newspapers, at least two days in advance of the date of said use.

(b) Display of red flags at Indian Head Beach and near the Point Pinos Lighthouse.

(c) Radio Broadcast.

(d) Notice to individual craft by a visit of a United States vessel.

(e) Telephone advice to such fishermen's organizations as may request, in writing, that such advice be given.

(iii) The regulations in this paragraph will be enforced by the Commanding General, Fort Ord, California.

(b) Navy mining operations area—(1) The danger zone. Shoreward of a line beginning at the stack at about latitude 36°58′06″, longitude 121°54′06″; thence 230° true, 6.0 miles; thence 140° true, 7.5 miles; thence 50° true to the shore.

(2) The regulations. The danger zone will be used for training in various phases of mine warfare operations. During the period from August 1 to February 15, inclusive, each year, no operations will be carried on which will involve placing any obstructions in the water nor will any operations be carried on at night. During the period from February 16 to July 31, inclusive, each year, operations may be carried on which will involve laying exercise mines and other moored or bottom obstructions. In each case when moored or bottom obstructions are laid a notice to mariners will be issued giving notice of their approximate location within the danger zone, and vessels shall keep clear.

§ 204.215 San Pablo Bay, Calif.; target practice area, Mare Island Naval Shipyard, Vallejo. (a) The danger zone. A sector in San Pablo Bay adjacent to the westerly shore of Mare Island with a radius of 3,900 yards, centered at a point bearing 316° true, 3,605 yards, from Mare Island Dike No. 14 Light, with limiting true bearings from that center of 266°30′ and 222°.

(b) The regulations. The Commander, Mare Island Naval Shipyard, Vallejo, California, will conduct target practice in the area at intervals of which the public will be duly notified. At such times vessels shall stay clear.

§ 204.221 Strait of Juan de Fuca, Wash.; naval operations areas for non-explosive air-to-surface target practice. (a) The danger zone. (1) Beginning at a point at latitude 48°16′30″, longitude 123°03′00″; thence east to latitude 48°16′30″, longitude 122°55′00″; thence northwesterly to latitude 48°21′00″, longitude 122°57′00″; thence to latitude 48°21′00″, longitude 123°05′00″; thence southeasterly to the point of beginning.

(2) The area will be used for air to surface target practice using non-explosive projectiles.

(3) All runs will be made under weather conditions which will insure that the pilot can determine from the air that the area is clear, and firing will be in a direction from any vessels near the area in order to eliminate all possibility of danger to property or life.

(4) No firing shall take place until the area is clear of all watercraft except those taking part in the practice.

(b) The regulations. (1) Between 8:00 a.m., and 4:00 p.m., Pacific standard time, no vessel or other craft shall enter or remain within the designated area except as authorized by the enforcing agency.

(2) Prior to the conducting of each practice the area will be patrolled by Naval vessels flying a "Baker" (red) flag, and unauthorized vessels found therein will be contacted and warned to immediately leave the area.

(3) Upon application, the Navy will grant special permission to others to pass through or otherwise use the area if no interference to the Navy's use of the area is evident.

(4) This section shall be enforced by the Commandant of the Thirteenth Naval District or his authorized representative.

§ 204.222 Hood Canal and Dabob Bay, Wash.; naval non-explosive torpedo testing areas. (a) Hood Canal in vicinity of Bangor—(1) The area. All waters of Hood Canal between latitude 47°46′00″ and latitude 47°42′00″, exclusive of navigation lanes one-fourth nautical mile wide along the west shore and along the east shore south from the town of Bangor (latitude 47°43′28″).

(2) The regulations. (i) The area will be used intermittently by the Navy for non-explosive torpedo ranging. Launching will be conducted only between 8:00 a.m., and sunset on days other than Saturdays, Sundays, and holidays. At no time will the navigation lanes generally paralleling the shore be closed to navigation.

(ii) Navigation will be permitted within the area at all times except when naval exercises are in progress. No vessel shall enter or remain in the area when such exercises are in progress. Prior to commencement of an exercise, the Navy will make an aerial or surface reconnaissance of the area. Vessels under way and laying a course through the area will not be interfered with, but they shall not delay their progress. Vessels anchored or cruising in the area and vessels unobserved by the Navy re-

connaissance which enter or are about to enter the area while a torpedo is in the water will be contacted by a Navy patrol boat and advised to steer clear. Torpedos will be tested only when all vessels or other craft have cleared the area.

(iii) When operation are in progress, use of the area will be indicated by the presence of Naval vessels flying a "Baker" (red) flag.

(iv) Notices of temporary suspension and revival of operations will be published in local newspapers and in Notice to Mariners published by the United States Coast Guard.

(b) Dabob Bay in the vicinity of Quilcene—(1) The area. All waters of Dabob Bay beginning at latitude 47°39′27″, longitude 122°52′22″; thence northeasterly to latitude 47°40′19″, longitude 122°50′10″; thence northeasterly to a point on the mean high water line at Takutsko Pt.; thence northerly along the mean high water line to latitude 47°48′00″; thence west on latitude 47°48′00″ to the mean high water line on the Bolton Peninsula; thence southwesterly along the mean high water line of the Bolton Peninsula to a point on longitude 122°51′06″; thence south on longitude 122°51′06″ to the mean high water line at Whitney Pt.; thence along the mean water line to a point on longitude 122°51′15″; thence southwesterly to the point of beginning.

(2) The regulations. (i) Propeller-driven or other noise-generating craft shall not work their screws or otherwise generate other than incidental noise in the area during periods of actual testing, which will be indicated by flashing red beacons at strategic locations, and all craft shall keep well clear of vessels engaged in such testing.

(ii) No vessel shall trawl or drag in the area.

(iii) No vessel shall anchor in the area except between the shore and the 10-fathom depth line.

(iv) Operations will normally be confined to the period from about 9:30 a.m., to 2:30 p.m., on Mondays through Fridays, and will normally consist of intermittent tests of less than 30 minutes duration, with boat passage permitted between tests. Transits of log-tows and other slow-moving traffic will be arranged on a mutually satisfactory individual basis as appropriate. Emergencies or high-priority projects may occasionally cause operations outside the periods specified above. No operations will be conducted on Sundays.

(c) The regulations in this section shall be enforced by the Commandant, Thirteenth Naval District, and such agencies as he may designate.'

§ 204.223 Pacific Ocean, Hawaii; danger zones. (a) Danger zones—(1) Low level aerial radar target off Kahuku Point, Island of Oahu, Hawaii. The waters within a circular area with radius of three (3) miles having its center at latitude 21°43′00″, longitude 157°56′30″.

(2) High and low level aerial bombing target surrounding Mokuhooniki Rock, Island of Molokai, Hawaii. [Revoked]

(3) Aerial bombing and strafing target surrounding Kaula Rock, Hawaii. The water within a crcular area with a radius of three (3) miles having its center on Kaula Rock at latitude 21°39′30″, longitude 160°32′30″.

(4) Aerial bombing target and naval shore bombardment area, Kahoolawe Island, Hawaii. The waters adjacent to Kahoolawe Island within the area encompassed by the following coordinates beginning at latitude 20°-37′30″, longitude 156°32′48″; thence to latitude 20°34′-48″, longitude 156°30′24″; thence to latitude 20°28′54″, longitude 156°30′30″; thence to latitude 20°28′06″, longitude 156°41′48″; thence to latitude 20°30′30″, longitude 156°44′12″; thence to latitude 20°33′12″, longitude 156°-44′30″; thence to latitude 20°37′30″, longitude 156°36′-24″; thence to the beginning coordinates.

(b) The regulations. (1) No vessel or other craft shall enter or remain in any of the areas at any time except as authorized by the enforcing agency.

(c) Enforcing agency. The regulations in this section shall be enforced by the Commandant, Fourteenth Naval District, and such agencies as he may designate.

§ 204.224 Pacific Ocean, Island of Oahu, Hawaii; danger zone. (a) The danger zone. Beginning at point of origin at Kaena Point Light in latitude 21°34′42″ N., longitude 158°16′54″ W.; thence on a bearing of 282°30′ true to latitude 21°38′ N., longitude 158°33′ W.; thence along the arc of a circle centered at Kaena Point Light to latitude 21°42′30″ N., longitude 158°03′ W.; thence on a bearing of 228° true to latitude 21°35′33″ N., longitude 158°11′30″ W.; thence to point of origin.

(b) The regulation. (1) The area will be closed to all shipping on specific dates to be designated for actual firing and no vessel or other craft shall enter or remain in the area during the times designated for firing except as may be authorized by the enforcing agency. Notification to maritime interests of specific dates of firing will be disseminated through the U.S. Coast Guard media of the Local Notice to Mariners and the NOTAMS published by the Corps of Engineers. On dates not specified for firing, the area will be open to normal maritime traffic.

(2) The regulations of this section shall be enforced by the Commanding General, United States Army, Hawaii/25th Infantry Division, APO 957, and such agencies as he may designate.

§ 204.225 Pacific Ocean off Kanewaa Point, Island of Hawaii, Hawaii; practice aerial target. (a) The danger zone. The waters within a circular area with a radius of one and one-half (1½) miles having its center at latitude 19°06′58.23″ N., longitude 155°54′28.07″ W.

(b) The regulations. (1) No vessel or other craft shall enter or remain in the area from sunrise to sunset, Monday through Friday of each week, except as authorized by the enforcing agency.

(2) The regulations in this section shall be enforced by the Commander, Fleet Air, Hawaii, located at the Naval Air Station, Barbers Point, Island of Oahu, Hawaii.

PART 207—NAVIGATION REGULATIONS:

§ 207.612 San Diego Harbor, Calif.: restricted areas. (a) The seaplane restricted area—(1) The area. (i) That portion of the central part of San Diego Bay, opposite National City, inclosed by lines connecting the following points, which are rectangular coordinates and are referred to the U.S. Coast and Geodetic Survey Station "Old Town" as their origin:

"a"—S. 25,015.85, E. 12,419.60
"b"—S. 27,720.44, E. 16,258.02
"c"—S. 30,489.60, E. 18,072.88
"d"—S. 31,932.83, E. 18,239.47
"e"—S. 34,403.93, E. 19,132.03
"f"—S. 39,271.04, E. 19,556.43
"g"—S. 41,814.54, E. 14,009.32
"h"—S. 41,454.18, E. 13,835.53
"i"—S. 40,893.33, E. 14,862.42
"j"—S. 35,648.50, E. 12,581.33
"k"—S. 36,228.63, E. 11,316.10
"l"—S. 33,132.35, E. 9,649.61
"m"—S. 32,481.78, E. 9,250.19
"n"—S. 32,378.63, E. 9,274.87
"o"—S. 31,654.25, E. 8,830.15
"p"—S. 31,629.57 E. 8,726.99
"q"—S. 30,966.36, E. 8,319.81
"r"—S. 30,897.59, E. 8,336.26
"s"—S. 30,812.37, E. 8,283.94
"t"—S. 30,795.92, E. 8,215.17
"u"—S. 30,135.58, E. 7,809,77

(ii) The area will be marked by the United States Navy by marine contact seadrome lights flashing amber.

(2) The regulations. (i) The area is hereby set aside for the use of seaplanes and their attendant plant and, except as provided in subdivision (ii) of this subparagraph, navigation within the area is restricted to seaplanes, their attendant plant, and vessels under the control of the United States.

(ii) At such periods as the area may not be required for use of seaplanes and their attendant plant, navigation by other craft may be permitted, provided permission is obtained in advance from the Commandant, Eleventh Naval District, San Diego, California.

(b) Restricted area between Ballast Point and Zuniga Point—(1) The area. An area in San Diego Bay between Ballast Point and Zuniga Point inclosed by lines connecting the following stations:

Station	Latitude	Longitude
A	32°41′17″	117°13′58″
B	32°41′19″	117°13′36.5″
C	32°41′01″	117°13′34″
D	32°40′59″	117°13′55″
E	32°41′03″	117°13′56″
A	32°41′17″	117°13′58″

(2) The regulations. (i) No vessel shall anchor within the restricted area at any time.

(ii) Dredging, dragging, seining, other fishing operations, and other activities not under the direction of the United States, which might foul underwater installations within the restricted area, are prohibited.

(iii) All tows entering the restricted areas shall be streamed and shortened to the seaward of the area and towing appendages and catenaries shall not be dragged along the bottom while proceeding through the area.

(iv) All vessels entering the restricted area shall proceed across the area by the most direct route and without unnecessary delay.

(v) The regulations in this section shall be enforced by the Commandant, Eleventh Naval District, San Diego, California, and such agencies as he may designate.

§ 207.612a Pacific Ocean off Point Loma, Calif.; naval restricted area. (a) The area. The waters of the Pacific Ocean within an area extending southerly from Point Loma, California, described as follows: Beginning at latitude 32°39′54″, longitude 117°13′18″; thence southeasterly to latitude 32°34′31″, longitude 117°09′41″; thence 270° true to longitude 117°16′40″; thence due north to latitude 32°39′54″; and thence 90° true to the point of beginning.

(b) The regulations. (1) No vessel shall anchor within the restricted area at any time without specific permission of the enforcing agency.

(2) Dredging, dragging, seining, and other similar operations within the restricted area are prohibited.

(3) The regulations in this section shall be enforced by the Commandant, Eleventh Naval District, San Diego, California, and such agencies as he may designate.

§ 207.613 Pacific Ocean; U.S. Navy restricted area in vicinity of Scripps Institution of Oceanography Pier, La Jolla, Calif. (a) The restricted area. An area in the Pacific Ocean at La Jolla, California, bounded as follows: Beginning at the seaward end of the Scripps Institution of Oceanography Pier, about 1.5 miles northeast of Point La Jolla Light; thence 205°07′ true, 1,000 feet; thence 270°00′ true, 4,009 feet; thence 00°00″ true, 2,628 feet; thence 78°34′ true, 3,568 feet; thence 138°00′ true, 2,040 feet; thence 205°07′ true 1,009 feet, to the point of beginning. The corners of the restricted area will be plainly marked with lighted marker buoys by the United States Navy.

(b) The regulations. (1) No vessels, other than vessels operated by or for the United States or the Scripps Institution of Oceanography, shall anchor within the restricted area at any time.

(2) Dredging, dragging, seining, other fishing operations, and other activities not under the direction of the United States or the Scripps Institution of Oceonography, which might foul underwater installations within the restricted area, are prohibited.

(3) All vessels entering the restricted area, other than vessels operated by or for the United States or the Scripps Institution of Oceonography, shall proceed across

the area by the most direct route and without unnecessary delay.

(4) This section shall be enforced by the Commandant, Eleventh Naval District, San Diego, California, and such agencies as he may designate.

§ 207.613a Pacific Ocean, U.S. Marine Corps Base, Camp Pendleton, California; restricted area. (a) The area. Beginning at the shoreline north of the boat basin, latitude 33°13′10″, longitude 117°24′19″; thence westward to latitude 33°12′48″, longitude 117°24′56″; thence southward to latitude 33°12′32″, longitude 117°24′44″; thence eastward to latitude 33°12′47″, longitude 117°24′17″ (a point on the breakwater); thence northeastward along breakwater to latitude 33°12′58″, longitude 117°24′09″; thence northward along shoreline to point of beginning.

(b) The regulations. (1) No vessels shall anchor within the restricted area at any time.

(2) Dredging, dragging, seining, fishing operations, and other activities, which might foul underwater installations within the restricted area, are prohibited.

(3) All vessels entering the restricted area shall proceed across the area by the most direct route and without unnecessary delay.

(4) The regulations in this section shall be enforced by the Commanding General, U.S. Marine Corps Base, Camp Pendleton, California, and such agencies as he may designate.

§ 207.614 Pacific Ocean off the east coast of San Clemente Island, Calif.; naval restricted area. (a) The area. The waters of the Pacific Ocean within an area extending easterly from the east coast of San Clemente Island, California, described as follows: The northerly boundary to be a continuation, to seaward of the existing southerly boundary of the Naval Restricted Anchorage Area, as described in § 202.218 of this chapter (Anchorage Regulations), to latitude 33°00.3′ N., longitude 118°31.1′ W.; thence to latitude 32°58.6′ N., longitude 118°30.0′ W.; thence to latitude 32°57.9′ N., longitude 118°31.3′ W. on the shoreline; thence northerly along the shoreline to point of beginning.

(b) The regulations. (1) No vessels, other than Naval Ordinance Test Station craft, and those cleared for entry by the Naval Ordnance Test Station, shall enter the area at any time except in an emergency, proceeding with extreme caution.

(2) Dredging, dragging, seining or other fishing operations within these boundaries are prohibited.

(3) No seaplanes, other than those approved for entry by Naval Ordnance Test Station, may enter the area.

(4) The regulations in this section shall be enforced by security personnel attached to the U.S. Naval Ordnance Test Station, China Lake, California, and by such agencies as may be designated by the Commandant, Eleventh Naval District, San Diego, California.

§ 207.615 Pacific Ocean, around San Nicolas Island California; naval restricted area. (a) The area. The waters of the Pacific Ocean around San Nicolas Island, California, extending about 3 miles seaward from the shoreline, described as follows:

Latitude	Longitude
33°10′10″	119°24′20″
33°10′10″	119°31′10″
33°12′00″	119°35′30″
33°14′20″	119°37′40″
33°16′40″	119°38′10″
33°19′10″	119°37′10″
33°20′10″	119°31′10″
33°17′40″	119°24′50″
33°13′50″	119°21′50″
33°10′10″	119°24′20″

(b) The regulations. (1) No vessels other than Pacific Missile Range craft and those cleared for entry by the Commander, Pacific Missile Range, or the Officer-in-Charge, San Nicolas Island, shall enter the area at any time except in an emergency, proceeding with extreme caution.

(2) Dredging, dragging, seining, or other fishing operations within these boundaries are prohibited.

(3) No seaplane, other than those approved for entry by the Pacific Missile Range, may enter the area.

(4) The regulations of this section shall be enforced by personnel attached to the Pacific Missile Range, Point Mugu, California, and by such agencies as may be designated by the Commandant, Eleventh Naval District, San Diego, California.

§ 207.616 Los Angeles and Long Beach Harbors, Calif.; naval restricted area. (a) The area. The waters of Los Angeles and Long Beach Harbors lying westerly of the Naval Base Mole and extending north from the westerly prolongation of the southern side of the mole and east from the eastern side and the southerly prolongation of the eastern side of non-anchorage Area I.

(b) The regulations. (1) No vessels, other than vessels operated by or for the United States, shall anchor within the area at any time.

(2) Dredging, dragging, seining, other fishing operations, and other activities not under the direction of the United States which might foul underwater installations are prohibited.

(3) All vessels entering the area, other than vessels operated by or for the United States, shall proceed across the area by the most direct route and without unnecessary delay.

(4) Only naval vessels and seaplanes shall enter the basin lying inside the jetty in front of the area known as Reeves Field, except as authorized by the enforcing agency.

(5) The regulations in this section shall be enforced by the Commander, U.S. Naval Base Los Angeles, Long Beach, California, and such agencies as he may designate.

691-231 O—63——5

§ 207.617 Long Beach Harbor, Calif.; naval restricted area. (a) The area. All the waters between the Navy mole and Terminal Island to the westward of longitude 118°13′10″.

(b) The regulations. (1) The area is reserved exclusively for use by naval vessels. Permission to enter the area must be obtained from the enforcing agency.

(2) The regulations in this section shall be enforced by the Commander, U.S. Naval Base Los Angeles, Long Beach, California, and such agencies as he may designate.

§207.618 Long Beach Harbor, Calif.; seaplane restricted area. (a) The area. The waters of San Pedro Bay within the following described area. Beginning at a point at latitude 33°45′17″, longitude 118°10′24″; thence to latitude 33°44′54″, longitude 118°08′02″; thence to latitude 33°44′39″, longitude 118°08′06″; thence to latitude 33°45′02″, longitude 118°10′27″; thence to the point of beginning.

(b) The regulations. (1) Seaplane landings may be made in the area on one hour's notice. All vessels, naval or commercial, anchoring in the area will be required to move within one hour's notice at any time, day or night.

(2) The area will be patrolled by small craft on the approach of seaplanes intending to land. During the hours of darkness, whenever seaplanes are approaching the area for landings, the area will be marked by flat-type rubber buoys showing fixed green lights. Seaplanes will ordinarily approach the area from the east, landing in the east-to-west direction. Prevailing wind at the time of the intended landings will determine the direction of approach.

(3) The regulations in this section shall be enforced by the Commander, U.S. Naval Base Los Angeles, Long Beach, California, and such agencies as he may designate.

§ 207.619 Santa Monica Bay, Calif.; restricted area. (a) The area. The waters of the Pacific Ocean, Santa Monica Bay, in an area extending seaward from the shoreline a distance of about 5 nautical miles (normal to the shoreline) and basically outlined as follows:

Station	Latitude N.	Longitude W.
A	33°54′59″	118°25′41″
B	33°54′59″	118°28′00″
C	33°53′59.5″	118°31′37″
D	33°56′19.5″	118°34′05″
E	33°56′25″	118°26′29″

(b) The regulations. (1) Vessels shall not anchor within the area at any time without permission.

(2) Dredging, dragging, seining, or other fishing operations which might foul underwater installations within the area are prohibited.

(3) All vessels entering the area, other than vessels operated by or for the United States, the State of California, the county of Los Angeles, or the city of Los Angeles, shall proceed across the area by the most direct route and without unnecessary delay. The area will be open and unrestricted to small recreational craft for recreational activities at all times.

(4) The placing of buoys, markers, or other devices requiring anchors will not be permitted.

(5) The city of Los Angeles will maintain a patrol of the area as needed.

(6) The regulations of this section shall be enforced by the Commander, Eleventh Coast Guard District, Times Building, Long Beach, California, and such agencies as he may designate.

§ 207.620 Pacific Ocean in vicinity of Santa Catalina Island, Calif.; seaplane restricted area near Avalon. (a) The area. Beginning at White Rock; thence 55° true, 5,000 feet; thence 325° true, 5,000 feet; thence 235° true, 5,400 feet; thence southeasterly along the shoreline to the point of beginning.

(b) The regulations. This area is reserved for the use of seaplane landings and take-offs. Floats or buoys are prohibited, except those authorized by the Department of the Army. Anchoring of vessels is prohibited. Vessels are not prohibited from passing through this area provided they proceed as expeditiously as practicable by the most direct route, and give seaplanes the right-of way at all times.

§ 207.640 San Francisco Bay, San Pablo Bay, Carquinez Strait, Suisun Bay, San Joaquin River, and connecting waters, Calif. (a) San Francisco Bay north of Alcatraz Island; submarine operating area—(1) The area. Bounded as follows: North boundary, latitude 37°50′38″; east boundary, longitude 122°25′00″; south boundary, latitude 37°50′00″; west boundary, longitude 122°26′10″;

(2) The regulations. Prior notification of the dates and times of all operations will be made by local notice to mariners. A patrol boat will direct the movement of vessels passing in the vicinity of the operating area by means of signal light and loud hailer. Vessels traversing this area shall be alert and comply with the orders of the patrol boat. The regulations in this paragraph shall be enforced by the Commandant, Twelfth Naval District, and such agencies as he may designate.

(b) San Francisco Bay in the vicinity of Alcatraz Island; restricted area—(1) The area. All waters within 200 yards of the shore of Alcatraz Island.

(2) The regulations. The use or navigation of the waters within this area by any vessel or craft other than vessels controlled and operated by the United States Government is prohibited unless authorized by an officer of the Department of Justice empowered by the Attorney General of the United States to grant such authority.

(c) San Francisco Bay in vicinity of Hunters Point; naval restricted area—(1) The area. Bounded by the shore of the San Francisco Naval Shipyard and the following lines: Beginning at a point on the northerly shore of the Shipyard bearing 292°40′, 950 yards, from Hunters Point Light; thence 35°27′, 730 yards to the U.S. Pierhead Line; thence 142°55′, 1,300 yards, along the Pierhead Line; thence 180°, 2,450 yards, to the San Francisco-San Mateo County Line; thence 270°, 430 yards along the County Line; thence 305°27′, 1,313 yards, to and along

the southwesterly side of South Basin; and thence due north, 413 yards, to the southwesterly shore of the Shipyard.

NOTE: All bearings in this section are referred to true meridian.

(2) The regulations. No vessel or other craft, except vessels of the United States Government or vessels duly authorized by the Commander, San Francisco Naval Shipyard, shall navigate, anchor, or moor in this area.

(d) San Francisco Bay at South San Francisco; seaplane restricted area—(1) The area. Bounded by the westerly shore of South San Francisco Bay and the following lines: Beginning at a point on shore bearing 152°-30′, 1,750 yards, from Aviation Beacon "Aero" at San Francisco Airport; thence to points which are the following bearings and distances from Aviation Beacon "Aero"; 99°30′, 9,070 yards; 81°30′, 6,530 yards; 41°30′, 6,100 yards; and 347°30′, 3,400 yards.

(2) The regulations. No surface watercraft shall be operated or anchored in this area except by specific permission of the Commanding Officer, Coast Guard Air Station, South San Francisco. Persons desiring to navigate vessels across the area shall give advice of their intention to do so and make request to the Commanding Officer not less than four hours in advance of the time they desire to take the vessel across the area.

(e) San Francisco Bay; seaplane restricted area, Naval Air Station, Alameda—(1) The seaplane restricted area. The waters of San Francisco Bay south of the Naval Air Station, Alameda, bounded on the north by the breakwater and turning basin at the Naval Air Station, and a line from Air Station Channel Lighted Buoy 6 to Air Station Channel Entrance Lighted Buoy 2; bounded on the west, south, and east by lines connecting Air Station Channel Entrance Lighted Buoy 2 and points which are the following bearings and distances from Hunters Point Light: 17°, 4,050 yards; 85°, 5,300 yards; 86°, 7,075 yards; 73°, 9,160 yards; and 70°30′, 9,300 yards; and bounded on the northeast by a line running from the last-described point 299° to the breakwater.

(2) The take-off zone. The area in San Francisco Bay southeast of the southeast boundary of General Anchorage 8 (described in § 202.224(a) of this chapter); north of the north boundary of General Anchorage 9 (described in § 202.224(a) of this chapter); northwest of the seaplane restricted area described in subparagraph (1) of this paragraph; and southwest of the southwest boundary of General Anchorage 9-A (described in § 202.224(a) of this chapter).

(3) The regulations. (i) Except as provided in subdivision (ii) of this subparagraph, no surface watercraft shall be operated or anchored in the seaplane restricted area except those attendant upon seaplane operations of the United States Navy or such other watercraft as have been given specific permission by the enforcing agency.

(ii) Surface watercraft may pass through the northerly part of the seaplane restricted area in a channel-way 800 feet wide adjacent to the southerly side of the breakwater protecting the turning basin at the Naval Air Station, turning at the western end of the breakwater, in a northwesterly direction, and connecting with the channel to the turning basin. Craft navigating this channel-way shall pass directly through and shall obey such verbal instructions regarding passage as may be given from the naval surface vessel patrolling the seadrome restricted area.

(iii) Vessels entering the take-off zone shall proceed through as necessary without delay. This area shall not be used for such purposes as drills, swinging ship, or other operations which would delay the vessel beyond the time required for normal transit. The enforcing agency may make exceptions to the provisions of this subparagraph if seaplane operations permit.

(iv) The regulations in this paragraph shall be enforced by the Commanding Officer, U.S. Naval Air Station, Alameda, California, and such agencies as he may designate.

(f) San Francisco Bay and Oakland Inner Harbor; restricted areas in vicinity of Naval Air Station, Alameda—(1) The areas. (i) The waters of San Francisco Bay within 100 yards of the Naval Air Station, Alameda.

(ii) The waters of the entrance channel to Oakland Inner Harbor (San Antonio Estuary) between the westerly end of the rock wall on the south side of the channel and the easterly boundary of the Naval Air Station.

(2) The regulations. (i) No vessel or other craft, except vessels of the United States Government or vessels duly authorized by the Commanding Officer, U.S. Naval Air Station, Alameda, California, shall navigate, anchor, or moor in the area described in subparagraph (1)(i) of this paragraph.

(ii) No vessel without special authority from the Commander, Twelfth Coast Guard District, shall lie, anchor, or moor in the area described in subparagraph (1)(ii) of this paragraph. Vessels may proceed through the entrance channel in process of ordinary navigation or may moor alongside wharves on the Oakland side of the channel.

(g) Oakland Harbor in vicinity of Naval Supply Center, Oakland; navigation. (1) All vessels over 1,000 tons displacement, bound for the Naval Supply Center, Oakland, shall use a qualified pilot regularly licensed for the waters of Oakland Harbor.

(2) All vessels over 1,000 tons displacement, bound for Naval Supply Center, Oakland, shall, before navigating the entrance channel, receive a signal that the channel is clear. Signals will be displayed on top of a signal tower which is located on top of a transit shed on the westerly end of Pier 4, Naval Supply Center. The signals are as follows:

(i) Clear channel. A black ball displayed from yard arm on top of signal tower between sunrise and sunset, and a green light displayed from the top of signal tower at night.

(ii) Foul channel. A red light displayed on top of signal tower during daylight and at night with the following meanings:

One flash each 15 seconds—channel will be clear in less than 1 hour.

Two flashes each 15 seconds—channel will be foul for 1 to 3 hours.

Three flashes each 15 seconds—channel will be foul for 3 or more hours.

(h) San Francisco Bay between Treasure Island and Yerba Buena Island; naval restricted area—(1) The area. All the water of the cove bounded by the south shore of Treasure Island, the north shore of Yerba Buena Island, and the connecting causeway, west of a line extending from the southeast corner of the most southerly of the four finger piers along the east side of Treasure Island, at about latitude 37°49′11″, longitude 122°21′40″, approximately 153°20′ to the northeasterly point of Yerba Buena Island, at about latitude 37°48′55″, longitude 122°21′30″.

(2) The regulations. No vessel or other craft, except vessels owned or operated by the United States Government or vessels duly authorized by the Commanding Officer, Naval Station, Treasure Island, shall enter the restricted area.

(i) San Francisco Bay adjacent to northeast corner of Treasure Island; naval restricted area—(1) The area. Beginning at the intersection of Pier 21 and the bulkhead line, thence northwesterly along the bulkhead to the northernmost point of Treasure Island; thence 288° true, 290 yards; thence 26° true, 475 yards; thence 115°30′ true, 520 yards; thence 152° true, 500 yards to Pier 21; thence along the pier to the point of beginning.

(2) The regulations. No vessels, except those engaged in naval operations, shall lie, anchor, moor or unnecessarily delay in the area. Vessels may pass through the area in the process of ordinary navigation except as directed by patrol boats. The regulations in this paragraph shall be enforced by the Commandant, Twelfth Naval District, and such agencies as he may designate.

(j) San Francisco Bay in vicinity of Naval Fuel Annex, Molate Point; restricted area—(1) The area. Bounded by the easterly shore of upper San Francisco Bay and the following lines: Beginning at a point on shore bearing 17°, 800 yards, from "Tree" at Molate Point; thence 270°, 870 yards; thence 180°, 1,100 yards; and thence 123° to the shore.

(2) The regulations. Vessels not operating under supervision of the local military or naval authority or public vessels of the United States shall not enter this area except by specific permission of the Commander, Twelfth Coast Guard District.

(k) Pinole Shoal Channel, San Pablo Bay; use, administration, and navigation. (1) The use of Pinole Shoal Channel is reserved for navigation of vessels of greater draft than 20 feet or by towboats with tows drawing more than 20 feet. Vessels operated by either sail or power and tows drawing less than 20 feet are not permitted to use this channel or to cross it at any point between San Pablo Bay Lighted Buoy 5 and San Pablo Bay Lighted Bell Buoy 13.

(2) Vessels permitted to use Pinole Shoal Channel under subparagraph (1) of this paragraph shall proceed through the channel at a reasonable speed so as not to endanger other vessels or interfere with any work which may become necessary in maintaining, surveying, or buoying the channel, and they shall not anchor in the channel, except in cases of emergency such as fog or accident which would render progress unsafe or impossible.

(3) This paragraph shall not be construed as prohibiting any necessary use of the channel by any Government boats while on Government duty, or in emergencies by pilot boats, whether steam or sail, or by police boats, or by the vessels of passenger steamship lines operated on regular schedules.

(l) San Pablo Bay, Carquinez Strait, and Mare Island Strait in vicinity of U.S. Naval Shipyard, Mare Island; restricted area—(1) The area. The waters of San Pablo Bay, Carquinez Strait, and Mare Island Strait, within 100 yards of the shore of that part of the Navy Yard, Mare Island, south of the causeway between the City of Vallejo and Mare Island and extending continuously therefrom southeasterly, southwesterly, and northwesterly around the Navy Yard to its northwesterly limit on the waters of San Pablo Bay, and the waters within 50 yards of any part of the berthing piers at the Navy Yard.

(2) The regulations. No vessel or other craft, except vessels of the United States Government or vessels duly authorized by the Commander, Mare Island Naval Shipyard, Vallejo, California, shall navigate, anchor, or moor in this area.

(m) Carquinez Strait in vicinity of Benicia Arsenal, Benicia; restricted area—(1) The area. Within 100 yards of the shore or of the wharf at the Benicia Arsenal.

(2) The regulations. No vessel or other craft, except vessels of the United States Government or vessels duly authorized by the Commander, Twelfth Coast Guard District, shall enter this area.

(n) Suisun Bay at Port Chicago; naval magazine restricted area—(1) The area. Beginning at a point on the shore and on the easterly side of the mouth of a small slough bearing 98°30′, 2,133 yards, from Point Edith Light; thence 340°30′, 400 yards, to the high water shore line of the most southerly of Seal Islands; thence 60°30′, 2,050 yards; thence 83°30′, 866 yards; thence 102°30′, 2,000 yards; thence 98°, 1,365 yards; thence 180°, 400 yards, to the high water shore line; thence following the high water shore line in a general southwesterly direction to the point of beginning.

(2) The regulations. Vessels not operating under the supervision of the local military or naval authority shall not enter this area except by specific permission of the Commander, Twelfth Coast Guard District.

(o) San Joaquin River Deep Water Channel between Suisan Bay and the easterly end of the channel at Stockton; use, administration, and navigation—(1) Maximum speed. The maximum speed for all ocean-going craft shall not exceed 10 miles per hour above the lower end of New York Slough, seven miles per hour above Criminal Point, or five miles per hour while passing any wharf, dock, or moored craft. As used in this subparagraph, the speed of a vessel when navigating with the current shall be its rate of movement in excess of the velocity of the current.

(2) Passing. All craft passing other boats, barges,

scows, etc., in motion, moored or anchored, shall slow down and take every necessary precaution to avoid damage.

(3) Right of way. (i) United States dredges, tugs, launches, derrick boats, and similar plant of contractors executing river and harbor improvement work for the United States, and displaying the signals prescribed by the regulations contained in Part 201 of this chapter shall have the right of way and other craft shall exercise special caution to avoid interference with the work on which the plant is engaged. Dredges, whether Federal or contractors' plant, working the channel must, however, take special care to give ocean-going vessels sufficient room for passing, and must lift both spuds and the ladder, and pull clear, if an adequate width of clear channelway cannot otherwise be provided. Ocean-going vessels may show at the masthead a black ball not more than 20 inches in diameter as a signal to the dredge, and may also blow five long blasts of the whistle when within reasonable hearing distance of the dredge, such signal to be followed at the proper time by the passing signal described in the local pilot rules. The dredge shall promptly acknowledge both signals in the usual manner.

(ii) Light-draft vessels when meeting or being overtaken by ocean-going vessels, shall give the right of way to such vessels by making use of the shallower portions of the waterway.

(iii) Rafts and tows must promptly give the channel side demanded upon proper signal by a vessel, and must be handled in such a manner as not to obstruct or interfere with the free use of the waterway by other craft.

(4) Collisions. (i) Ocean-going vessels in collision in the channel or turning basin must, if still afloat and in a condition making anchorage necessary, be immediately removed to an approved anchorage ground, or if in such condition that beaching is necessary, they shall be temporarily beached on the northwest side of Mandeville Island or in the Old River.

(ii) Light-draft vessels suffering collision shall be disposed of as directed by the District Engineer, Corps of Engineers, or his authorized representative.

(5) Wrecks. In no case following accidents of fire or collision will a vessel be allowed to remain either anchored or grounded in the channel, or beached at any place where it endangers other vessels, while settlement is pending with the underwriters.

(6) Other laws and regulations. In all other respects, the existing Federal laws and rules and regulations affecting navigable waters of the United States will govern in this channel.

(p) Sacramento Deep Water Ship Channel between Suisun Bay and easterly end of Turning Basin at West Sacramento; use, administration, and navigation—(1) Maximum speed for all ocean going craft—(i) Between Tolands Landing (Mile 6.2) and Rio Vista Bridge. When going against a current of two knots or more, the maximum speed over the bottom shall not exceed 8 knots. When going with the current, in slack water, or against a current of two knots or less, the maximum speed through the water shall not exceed 10 knots.

(ii) Between Rio Vista Bridge and Port of Sacramento. When going against a current of two knots or more, the maximum speed over the bottom shall not exceed 5 knots. When going with the current, in slack water, or against a current of two knots or less, the maximum speed through the water shall not exceed 7 knots.

(iii) Speed past docks or moored craft. Within 550 feet of the centerline of the channel the speed shall be the minimum required to maintain steerageway; wind, tide, current, etc., being taken into consideration.

(iv) Passing. All craft passing other boats, barges, scows, etc., underway, moored or anchored, shall take every necessary precaution to avoid damage.

(v) Speed, high-water precautions. When passing another vessel (underway, anchored, or tied up); a wharf or other structure; work under construction; plant engaged in river and harbor improvement; levees withstanding flood waters; buildings partially or wholly submerged by high water; or any other structure liable to damage by collision, suction or wave action; vessels shall give as much leeway as circumstances permit and reduce their speed sufficiently to preclude causing damage to the vessel or structure being passed. As deemed necessary for public safety during high river stages, floods, or other emergencies, the District Engineer may prescribe, by navigation bulletins or other means, the limiting speed in knots or temporarily close the waterway or any reach of it to traffic. Since this subparagraph pertains directly to the manner in which vessels are operated, masters of vessels shall be held responsible for strict observance and full compliance herewith.

(2) Right of way. (i) Dredges, tugs, launches, derrick boats and other similar equipment, executing river and harbor improvement work for the United States, and displaying the signals prescribed by the regulations contained in Part 80, Title 33, CFR, shall have the right-of-way and other craft shall exercise special caution to avoid interference with the work on which the plant is engaged. Dredges, whether Federal or contractor's plant, working the channel must however, take special care to give ocean-going vessels sufficient room for passing, and must lift both spuds and the ladder, and pull clear, if an adequate width of clear channelway cannot otherwise be provided.

(ii) Vessels intending to pass dredges of other types of floating plant working in navigable channels, when within a reasonable distance therefrom and not in any case over a mile, shall indicate such intention by one long blast of the whistle, and shall be directed to the proper side for passage by the sounding, by the dredge or other floating plant, of the signal prescribed in the inland pilot rules for vessels underway and approaching each other from opposite directions, which shall be answered in the usual manner by the approaching vessel. If the channel is not clear, the floating plant shall sound the

alarm or danger signal and the approaching vessel shall slow down or stop and await further signal from the plant.

(iii) When the pipeline from a dredge crosses the channel in such a way that an approaching vessel cannot pass safely around the pipeline or dredge, there shall be sounded immediately from the dredge the alarm or danger signal and the approaching vessel shall slow down or stop and await further signal from the dredge. The pipeline shall then be opened and the channel cleared as soon as practicable; when the channel is clear for passage the dredge shall so indicate by sounding the usual passing signal as prescribed in subdivision (ii) of this subparagraph. The approaching vessel shall answer with a corresponding signal and pass promptly.

(iv) When any pipeline or swinging dredge shall have given an approaching vessel or tow the signal that the channel is clear, the dredge shall straighten out within the cut for the passage of the vessel or tow.

(v) Shallow draft vessels when meeting or being overtaken by ocean-going vessels, shall give the right-of-way to such vessels by making use of the shallower portions of the waterway, wherever possible.

(vi) Tows should promptly give the channel side requested by proper signal from a vessel, and should be handled in such a manner as not to obstruct or interfere with the free use of the waterway by other craft.

(3) Obstruction of traffic. (i) Except as provided in subparagraph (2) of this paragraph no person shall wilfully or carelessly obstruct the free navigation of the waterway, or delay any vessel having the right to use the waterway.

(ii) No vessel shall anchor within the channel except in distress or under stress of weather. Any vessel so anchored shall be moved as quickly as possible to such anchorage as will leave the channel clear for the passage of vessels.

(iii) Motorboats, sailboats, rowboats, and other small craft shall not anchor or drift in the regular ship channel except under stress of weather or in case of breakdown. Such craft shall be so operated that they will not interfere with or endanger the movement of commercial or public vessels.

(4) Collisions. (i) Ocean-going vessels in collision in the channel or turning basin, must if still afloat and in a condition making anchorage necessary, be immediately removed to an approved anchorage ground, of if in such condition that beaching is necessary, they shall be temporarily beached on the southwest side of Ryer Island from Mile 15.0 to Mile 16.3 or in the Harbor and Turning Basin at West Sacramento.

(ii) Light-draft vessels suffering collision shall be disposed of as directed by the District Engineer, Corps of Engineers, or his authorized representative.

(5) Marine accidents. Masters, mates, pilots, owners, or other persons using the waterway to which this paragraph applies shall notify the Commander, 12th U.S. Coast Guard District and District Engineer and in the case of undocumented vessels, the State Division of Small Craft Harbors also, by the most expeditious means available of all marine accidents, such as fire, collision, sinking or stranding, where there is possible obstruction of the channel or interference with navigation or where damage to Government property is involved, furnishing a clear statement as to the name, address, and ownership of the vessel or vessels involved, the time and place, and the action taken. In all cases, the owner of the sunken vessel shall take immediate steps to mark the wreck properly.

(6) Other laws and regulations. In all other respects, existing Federal laws and rules and regulations affecting navigable waters of the United States will govern in this channel.

(q) Sacramento Deep Water Ship Channel Barge Lock and Approach Canals; use, administration and navigation—(1) General. The lock, its approach channels and all its appurtenances, including the highway and railroad bridge, shall be under the jurisdiction of the District Engineer, U.S. Army Engineer District, Sacramento, Federal and Courts Building, 650 Capitol Avenue, Sacramento, California. This designated representative at the locality shall be the lockmaster, who will be in immediate charge of movement and position of all water traffic while at or near the locks and in the barge canals.

(2) Immediate control. The lockmaster shall be charged with the immediate control and management of the lock, bridge, and of the area set aside as the lock area, including the entrance channels. He shall see that all laws, rules and regulations for the use of the lock, bridge and the lock area are duly complied with, to which end he is authorized to give all necessary orders and directions in accordance therewith, both to employees of the Government and to any and every person within the Government lock area. Crews shall render such assistance in the lockage of their craft as may be required by the lockmaster.

(3) Signals—(i) Sound. All craft desiring lockage shall signal by two long blasts followed by two short blasts of the whistle, delivered at a distance of one-half mile from the lock. When the lock is ready for entrance, notice will be given by one long blast from the control house. Permission to leave the lock will be one short blast given by the lockmaster.

(ii) Visual lock traffic signals. Visual signals are located outside of each lock gate on the north guide wall, and will be used in conjunction with sound signals. When the red light is flashing, lock cannot be made ready for entrance immediately, vessel must stand clear. When the amber light is flashing, lock is being made ready, prepare for lockage. When the green light is flashing, lock is ready for entrance, the vessel may proceed with caution into the lock.

(iii) Visual river traffic signals. Visual signals are located on the south bank of the barge canal at the confluence with the Sacramento River and also 1,950 feet upstream on the west bank of the Sacramento River. When the red light is on, a river-bound vessel of a size making passing in the canal hazardous is in the lock or canal. Approaching vessel shall stand clear of canal to permit outgoing vessel to pass. When the amber light is on, a river-bound vessel of a size to permit passing is in the lock or

canal. Vessel may enter canal with caution. When the green light is on, vessel may enter canal and proceed under full control.

(iv) Radio. The lock is equipped with two-way radio operating on a frequency of 156.60 mc. The frequency is monitored by the lock personnel. Vessels equipped with two-way radio may communicate with the crew operating the lock but communications or signals so received will only augment and not replace the sound and visual signals.

(4) Permissible dimensions of vessels and tows. The lock chamber has a maximum usable width of 86 feet and length of 600 feet. The sill at the harbor end and the bottom of the lock chamber are —13.0 feet elevation, CofE datum, and usually provides a depth of water ranging from 14.0 feet at LLW to 19.4 feet at HHW, with greater depths during large floods in the delta. The sill at the river end is at —10.0 feet elevation, CofE datum, and usually provides a depth of water ranging from 14.6 feet at LLW to 16.8 feet at HHW, with greater depths when the river is high. The depth of water at any time is indicated by staff gages located on the south wall of the lock, riverward and harborward of each lock gate and at the center of the lock. A vessel must not attempt to enter the lock if its beam or length is greater than indicated above, or if its draft exceeds the depth of water indicated by the gages, with due allowance for clearance.

(5) Precedence at lock. Ordinarily, craft will be locked through in order of arrival; however, depending upon whether the lock is full or empty, this precedence may be modified at the discretion of the lockmaster if boats are approaching from the opposite direction and are within reasonable distance of the lock at the time of the approach by the first boat. When several craft are to pass, precedence shall be given as follows:

First: Government owned or controlled craft.

Second: Commercial craft.

Third: Passenger boats.

Fourth: Small vessels and pleasure boats.

(6) Loss of turn. Boats that fail to enter the lock with reasonable promptness, after being authorized to do so, shall lose their turn.

(7) Multiple lockage. The lockmaster shall decide whether one or more vessels may be locked through at the same time.

(8) Speed. Vessels shall not be raced or crowded alongside another in the barge canals. When entering the barge canals and lock, speed shall be reduced to a minimum consistent with safe navigation. As a general rule, when a number of vessels are entering the lock, the following vessel shall remain at least 200 feet astern of the vessel ahead. No overtaking, except when directed by lockmaster, will be permitted.

(9) Lockage of small boats—(i) General. The lockage of pleasure boats, skiffs, fishing boats and other small craft will be coordinated with the lockage of commercial craft. If no commercial craft are scheduled to be locked through within a reasonable time, not to exceed one hour after the arrival of the small craft at the lock, separate lockage will be made for such small craft.

(ii) Signals. Small boats desiring to use the lock will sound two long blasts followed by two short blasts of the horn. When the lock is ready for entrance, the lockmaster will notify the small boat by one long blast of the horn; or through the public address system. Permission to leave the lock will be given by the lockmaster by one short blast of the horn.

(10) Mooring in lock. All boats, when in the lock, shall be moored to the fastenings provided for that purpose, by bow and stern lines and other spring lines as may be necessary, and the lines shall not be let go until the signal is given by the lockmaster for the craft to leave the lock.

(11) Waiting for lockage. The mooring or anchoring of boats or other craft in the approaches to the lock, where such mooring will interfere with navigation of the lock is prohibited. All boats, barge tows and other craft to be passed through the lock shall lie in designated waiting areas in such manner as not to interfere with the navigation of the lock or its approaches, and, if a barge tow is to be divided into sections for locking, the sections shall be brought into the lock as directed by the lockmaster. After passing through the lock, the sections shall be reassembled at such a distance from the entrance as not to obstruct or interfere with navigation of the lock or its approaches.

(12) Delay in lock. Boats or barges must not obstruct navigation by unnecessary delays in entering or leaving the lock.

(13) Damage to lock or other structures. The regulations contained in this paragraph shall not relieve the owners and operators of vessels from liability for any damage by their operations to the lock or other structures. They must use great care not to strike any part of the lock, any gate or appurtenance thereto, or machinery for operating the gates, or the walls protecting the banks of the approach canals. All boats with metal nosings or projecting irons, or rough surfaces that would be liable to damage the gates or lock walls, will not be permitted to enter the lock unless provided with suitable buffers and fenders.

(14) Tows. Tows shall be made up outside the canal entrance. All vessels engaged in towing other vessels not equipped with a rudder shall use two tow lines or a bridge and one tow line. If the vessel in tow is equipped with a rudder, one tow line may be used. All tow lines or hawsers must be hauled as short as practicable for safe handling of tows.

(15) Crew to move craft. The pilots in charge of tows and persons in charge of other craft must provide a sufficient number of men to handle lines in mooring craft and to move barges and other craft into and out of the lock easily and promptly.

(16) Handling valves, gates, bridges and machinery. No person, unless authorized by the lockmaster shall open or close any bridge, gate, valve or operate any machinery in connection with the lock; but the lockmaster may, under emergency conditions, call for assistance from the master of any boat using the lock, should such aid be necessary, and when rendering such assistance, the man

so employed shall be strictly under the orders of the lockmaster.

(17) Landing of freight. No one shall land freight or baggage on or over the walls of the lock so as in any way to delay or interfere with navigation or the operation of the lock.

(18) Refuse in lock. No material of any kind shall be thrown or discharged into the lock, and no material of any kind shall be deposited into the lock area.

(19) Statistics. On each passage through the locks, as required by section 11 of the River and Harbor Act of September 22, 1922 (42 Stat. 1043; 33 U.S.C.A. 555) the master or clerk of any vessel or other craft shall furnish; upon prescribed forms provided for the purpose and obtainable at the locks, a statement of the passengers, freight and tonnage and such other statistical information as may be required by the forms.

(20) Persistent violation of regulations. If the owner or pilot of any boat persistently violates the regulations of this paragraph after due notice of the same, lockage may be refused by the lockmaster at the time of violation or subsequent thereto, as required in the interest of public safety or protection of Government property.

(21) Other laws and regulations. In all other respects, the existing Federal laws, rules and regulations affecting navigable waters of the United States will govern in the use, administration and navigation of the ship channel, lock and its approaches.

§ 207.642 Lake Tahoe, Calif.; restricted areas along south shore. (a) The areas—(1) Baldwin Beach, under the control of the Forest Service, Department of Agriculture. The waters of Lake Tahoe shoreward of a line described as follows: Beginning at the intersection of the high waterline with the west boundary line of Lot 2, Section 26, Township 13 North (Mount Diablo Base Line), Range 17 East (Mount Diablo Meridian); thence north 300 feet; thence southeasterly about 2,850 feet to the east line of Section 26 at a point 300 feet north of the high waterline; thence northeasterly 1,740 feet to a point 300 feet north of the high waterline; thence southeasterly about 1,810 feet to the projected east line of the former Baldwin property at a point 300 feet north of the high waterline; and thence south 300 feet to the high waterline.

(2) Pope Beach, under the control of the Forest Service, Department of Agriculture. The waters of Lake Tahoe shoreward of a line described as follows: Beginning at the intersection of the high waterline with the west line of the former Pope property, about 750 feet westerly of the west boundary line of Lot 2, Section 6, Township 12 North (Mount Diablo Base Line), Range 18 East (Mount Diablo Meridian); thence north 300 feet; thence southeasterly 4,200 feet to a point 300 feet north of the high waterline; and thence south 300 feet to the high waterline.

(3) El Dorado County Beach. The waters of Lake Tahoe shoreward of a line described as follows: Beginning at the intersection of the high waterline with the west boundary line of Lot 1, Section 32, Township 13 North (Mount Diablo Base Line), Range 18 East (Mount Diablo Meridian); thence north 500 feet; thence northeasterly about 1,350 feet to the projected east line of Lot 1 at a point 500 feet north of the high waterline; and thence south 500 feet to the high waterline.

(b) The regulations. No sail or machine-propelled watercraft, except vessels owned, or controlled by the United States Government and vessels duly authorized by the United States Coast Guard, shall navigate or anchor in the restricted areas.

§ 207.643 Lake Tahoe, Nevada; restricted area adjacent to Nevada Beach. (a) The restricted area. The waters of Lake Tahoe shoreward of a line described as follows: Beginning at the intersection of the high waterline with a line projected in a general southerly direction 200 feet from a point lying 310 feet west of section corner common to section 15, 16, 21, and 22, Township 13 North (Mt. Diablo Base Line), Range 18 East (Mt. Diablo Meridian); thence 300 feet lakeward at right angles to the high waterline; thence southeasterly approximately 2,170 feet to the projected south boundary line of the Forest Service property at a point 300 feet west of the high waterline; and thence east 300 feet to the high waterline.

(b) The regulations. No sail or motor propelled water craft, except vessels owned or controlled by the United States Government and vessels duly authorized by the United States Coast Guard shall navigate or anchor in the restricted area.

§ 207.655 Rogue River, Oregon; logging. The dumping of logs into the Rogue River or upon its banks, below the high water line and the rafting of logs, or floating of loose logs, sack rafts of timber and logs, and the towing of log rafts on Rogue River, is hereby limited to the period from 1 November of each year to 31 March of the following year (both dates inclusive). Parties engaged in logging operations on the Rogue River shall arrange their work so that the river shall be free from floating logs or debris caused by their operation from 1 April to 31 October of each year (both dates inclusive).

§ 207.660 Coquille River, Oreg.; logging on North Fork between its mouth and Gravel Ford, at the junction of the North and East Forks. During the 144 hours extending from midnight of each Wednesday to midnight of the following Tuesday loose timber and logs, and sack rafts (so called) of timber and logs, may be run, and parties engaged in this business may use the waterway in such reasonable manner as may be necessary for the proper transaction of such business: Provided, That during any other period than that designated above said parties shall so arrange their work as to leave the channel of said section of the river free from floating logs and timber and shall not obstruct or delay any other navigation interest.

§ 207.663 South Fork of Coos River, Oreg.; logging in tidal section. (a) During the months of August, September, and October loose timber and logs and sack rafts

of timber and logs, hereinafter referred to as logs, may be floated in the tidal section of the South Fork of Coos River above the mouth of Bessie Creek, at the times and under the conditions hereinafter prescribed, on Monday only of each week: Provided, That if it is impracticable because of insufficient streamflow above the tidal section to float logs into the tidal section on any Monday, they may be floated in the tidal section, at the times and under the conditions hereinafter prescribed, on the first day between that Monday and the following Monday when the streamflow will permit.

(b) From November to July, both inclusive, logs may be floated in the tidal section of the South Fork of Coos River above the mouth of Bessie Creek, at the times and under the conditions prescribed in paragraphs (c) to (j) of this section on Tuesday and Friday only of each week.

(c) On any of the days designated in paragraphs (a) and (b) of this section when the floating of logs is permitted in the tidal section above the mouth of Bessie Creek, they may be floated into the tidal section, at or near the head of tidewater, not more than two hours before the time of high tide at the point of entry, and be floated to the mouth of Bessie Creek: Provided, That such movement is handled expeditiously, and is entirely completed within five hours after the time of high tide at the point of entry.

(d) Two high tides normally occur each day. The high tide upon which logs may be floated into the tidal section above the mouth of Bessie Creek shall be the tide that reaches high slack at the point of entry nearest 12:00 o'clock meridian, Pacific standard time. The time of high tide at the head of the tidal section, for the purpose of this section, shall be considered as two hours and forty minutes after the predicted time of high tide at Humbolt Bay, California, the port of reference for Coos Bay, as published by the Coast and Geodetic Survey, Department of Commerce.

(e) In order that the river may be cleared in advance of an anticipated freshet, whenever the river stage above the tidal section rises more than two feet above the normal winter level as determined by the District Engineer, Corps of Engineers, in charge of the waterway, logs may be floated in the tidal section above the mouth of Bessie Creek.

(f) A single floating sheer boom shall be swung across the river above the mouth of Bessie Creek, at a location approved by the District Engineer, for the purpose of catching logs being floated as prescribed in paragraph (e) of this section: Provided, That such boom shall be in place only during the period in which the floating of logs is under way: Provided further, That at all times when such boom is swung across the river so as to obstruct or interfere with navigation a competent operator shall be in attendance who shall, upon the approach of any craft or tow desiring to pass either upstream or downstream, promptly swing the boom so as to clear the channel and allow such craft or tow to pass.

(g) A written or printed notice giving the day and hour at which time the floating of logs is contemplated in accordance with paragraphs (a) and (b) of this section shall be posted at least twenty-four hours prior thereto at such place at or near the mouth of the South Fork as shall be prescribed by the District Engineer, and shall also be attached to the warning flag pole provided for in paragraph (h) of this section.

(h) At all times between sunrise and sunset when logs are being moved in the tidal section above the mouth of Bessie Creek, and during a period of three hours before such movement is to begin, a red flag not less than three feet square shall be flown from a staff on the river bank near the mouth of Bessie Creek, so located that it can be plainly seen by operators of river craft proceeding upstream in that vicinity, and said flag shall not be flown at any time other than herein designated. Between sunset and sunrise a red light, instead of a red flag, shall be so displayed. After completion of each movement of logs the red signal shall be promptly removed.

(i) In that portion of the South Fork below the mouth of Bessie Creek, the floating of logs shall be prohibited at all times, and rafts shall not exceed 650 feet in length and 45 feet in width.

(j) This section shall not affect the liability of persons in charge of logging operations for any damages resulting therefrom.

§ 207.670 Columbia and Willamette Rivers, Washington and Oregon; administration and navigation. (a) Supervision. The District Engineer, U.S. Army Engineer District, Portland, Oregon, has certain administrative supervision over the Columbia and Willamette Rivers, and is charged with the enforcement under his direction of emergency regulations to govern navigation of these streams.

(b) Speed. During very high water stages (usually 25 feet or more on the Vancouver, Washington, gage) when lives, floating plant or major shore installations are endangered, the District Engineer shall have authority to prescribe such temporary speed regulations as he may deem necessary for the public safety. During critical periods of freshets under 25 feet on the Vancouver, Washington, gage when construction is in progress, rehabilitation, or other unusual emergency makes a major shore installation susceptible to loss or major damage from wave action, the District Engineer shall have authority to prescribe for a particular limited reach of the river as appropriate such temporary speed regulations as he may deem necessary to protect the integrity of such structure. All speed regulations prescribed by the District Engineer shall be obeyed for the duration of the emergency and shall be terminated at the earliest practicable time that improved stream conditions permit.

§ 207.680 Willamette River, Oreg.; use, administration, and navigation of canal and locks at Willamette Falls, Oreg. (a) Administration—(1) Administrative jurisdiction. The canal and locks and all appurtenances shall be in charge of the District Engineer, Portland District, Corps of Engineers, Department of the Army, 628 Pittock Block, Portland, Oregon. The representative of the District Engineer at the locality shall be the lock

master, who shall receive his orders and instructions from the District Engineer. In case of emergency, however, the lock master shall have authority to take such steps as may be immediately necessary without waiting for instruction from the District Engineer.

(2) Operational jurisdiction. The lock master shall be charged with the immediate control and management of the canal and locks and the grounds and public property pertaining thereto. He shall see that all laws, rules and regulations, for the use of the canal and grounds are duly complied with, to which end he is authorized to give all necessary orders and directions in accordance therewith, both to employees of the Government and to any and every person within the limits of the canal and locks or grounds pertaining thereto, whether navigating the canal or not. In case of the absence or disability of the lock master, his duty shall be performed by an assistant or other employee to be designated by the District Engineer.

(b) Use and navigation—(1) Authority of lock master. The lock master or his assistants shall direct the movement, operation, and moorage of all vessels, boats, rafts, barges, or other floating things using the locks, while they are in the locks, the canal basin, or in either the upstream or downstream lock approaches. Crews of vessels, boats, rafts, barges, or other floating things seeking lockage shall render such assistance as the lock master or his assistants may require.

(2) Signals. All vessels desiring lockage shall signal the same by one long and one short blast of the whistle, delivered at a distance of approximately 1,000 feet from the locks. Requests for lockage may also be made by telephoning or otherwise notifying the lock master's office. Notice to vessels desiring lockage will be given by red and green traffic lights. Vessels may enter locks on green lights, but must await green signal when lights are red. Permission to leave the lock will be given in the same manner. In the event a failure occurs and the referenced lights cannot be operated, the lock master will indicate by voice or by hand or lantern signals when vessels may enter or leave the locks.

(3) Controlling dimensions. For lockage purposes the maximum length of space available is 175 feet and the maximum clear width available is 37 feet. All vessels, boats, rafts, barges, or other floating things of less size than the foregoing dimensions can pass through the locks. The controlling water depth over the intermediate miter sills throughout the locks is 6.5 feet. However, the depth on the sill of the upstream gate at low water is 7.5 feet and over the downstream sill is 8.4 feet. The elevation of the upstream sill is 43.7 feet and of the downstream sill is —6.4 feet, corresponding to the elevations shown on the gages provided at both the downstream and upstream approaches to the locks. All vessels, boats, rafts, barges, and other floating things of which the dimensions or draft are greater than will permit clearing any of the above indicated elevations shall be prohibited from entering the locks. All vessels, boats, rafts, barges or other floating things entering the locks in violation of the above shall be responsible for all resulting damages.

(4) Precedence at locks. Ordinarily the vessel, boat, raft, barge, or other floating thing arriving first at the lock will be locked through first. In the event of a simultaneous approach from opposite directions ascending craft will ordinarily be locked through first. When several boats are to be passed through the locks, the order of precedence shall be as follows:

(i) To boats owned by the United States or employed upon river and harbor improvement work.

(ii) To passenger boats.

(iii) To freight and tow boats.

(iv) To rafts.

(v) To small vessels and pleasure craft.

The lock master shall have authority to digress from the above precedence in order to eliminate reversing the flow of traffic through the locks when both upbound and downbound lockages are in waiting.

(5) Entrance to locks. The lock master shall decide whether one or more vessels may be locked through at the same time. No one shall attempt to enter the locks with a vessel or attempt to cause a vessel to enter the locks until he is authorized by the lock master to do so. No one shall take a vessel, or cause a vessel to be taken, within the limits of 500 feet above the upper gate and 300 feet below the lower gate, except for the purpose of entering the locks; and not for this purpose until it has been indicated to him by a proper person by signal that the lock is ready to receive the vessel. All vessels within the foregoing limits must be operated under "slow bell" and be kept constantly under control.

(6) Lockage of small boats. Pleasure boats, skiffs, fishing boats, and other small craft may be passed through the locks singularly, in groups, or as part of a lockage of other than pleasure craft. A continual flow of traffic in one direction will not be interrupted or reversed to accommodate these small pleasure boats. However, any such small boat will be accommodated at such time as the lock master upon receipt of a request for lockage deems such action will not interfere with other traffic. The decision of the lock master shall be final as to whether craft requesting lockage is defined as a pleasure boat.

(7) Use of canal and locks. No person, unless authorized by the lock master or his assistants, shall open or close any bridge, lock gate, wicket gate, or operate any lock machinery, or in any way interfere with any mechanism or appliance connected with the operation of the locks, nor shall anyone interfere with the employees in the discharge of their duties. The lock master or his assistants may call for aid from the persons in charge of any craft, vessel, or raft using the lock, should such aid be necessary. Persons rendering such assistance shall be strictly under the orders of the lockmaster. The Government reserves the right to refuse lockage to any vessel, craft or raft when the persons in charge thereof refuse to give such assistance when it is requested. The persons in charge of vessels with tows or rafts, barges and other craft must provide sufficient personnel, lines and towing equipment of sufficient power to insure at all times full control of such tows, rafts, barges and other craft while moving into and through the locks, unless otherwise pre-

arranged with the lock master. A copy of these regulations shall be kept at all times on board each vessel regularly engaged in navigating the locks. Copies may be obtained without charge from the lock master or from the District Engineer, Corps of Engineers, Department of the Army, 628 Pittock Block, Portland 5, Oregon.

(8) Petroleum vessels. All tankers, barges, and other floating equipment, used for transporting inflammable liquids, either with or without cargo, shall be equipped with fixed timber fenders and, if not so equipped, shall have aboard an adequate number of suitable fenders of timber, rubber, or rope which are to be placed between the vessel and unfendered lock structures. All such barges or other vessels navigating without power within the canal or locks must be assisted by one or more tugs of sufficient power to insure full control at all times whether passing upstream or downstream through the locks with or without cargo.

(9) Mooring in locks. All boats, barges, rafts, and other craft when in the locks shall be moored by head and spring lines and such other lines as may be necessary to the fastenings provided for that purpose; and the lines shall not be unloosed until the signal is given for the vessel to leave the lock.

(10) Mooring while waiting for lockage. The mooring of boats, tows or other craft in the approaches to the locks where such mooring will interfere with navigation or other vessels to or from the locks is prohibited.

(11) Delays. Boats, barges, rafts, or other craft must not obstruct navigation by unnecessary delay in entering or leaving the locks. Vessels failing to enter the locks with reasonable promptness, when signaled to do so, and vessels arriving at the locks with their tows in such shape so as to impede lockage shall forfeit their turn.

(12) Landing of freight. No freight or baggage shall be unloaded on or over the walls of the canal or locks. Freight and baggage consigned to the Willamette Falls locks shall be unloaded only at such places as may be provided for this purpose or as directed by the lock master.

(13) Refuse in canal or locks. No refuse or other material shall be thrown or dumped from vessels into the canal and locks, or deposited in the lock area, or placed on the berm of the canal so that it is liable to be thrown or washed into the waterway. Violations of this subparagraph shall be subject to sections 13 and 16 of the River and Harbor Act of March 3, 1899 (33 U.S.C. 407, 411).

(14) Damage to locks or other structures. The regulations contained in this section shall not affect the liability of the owners and operators of vessels for any damage caused by their operations to the locks or other structures. Persons in charge of vessels and log rafts passing through the locks must use great care to prevent the vessels or log rafts from striking any gate or appurtenance thereto. All boats or barges with metal nosings, or projecting irons, or rough surfaces, and log rafts with dragging cables that may damage any part of the lock structures will not be permitted to enter the locks unless said craft are provided with suitable protective buffers and fenders and log rafts are free of loose, dragging cables.

(c) Statistics. Masters or pursers of vessels shall upon each passage through the locks or upon each passage to an intermediate point of terminus within the locks system, furnish the lock master with information concerning the number of passengers, the amount of freight, the net registered tonnage and such other statistics as may be required on the prescribed forms which shall be furnished by the lock master for this purpose. Failure to furnish such information shall be construed as sufficient cause to refuse the offending vessel passage through the locks.

(d) Trespass. No one shall trespass on the grounds or buildings, and everyone shall be deemed guilty of trespass within the meaning of this paragraph who shall willfully or carelessly damage or disfigure the canal and locks or any part thereof, or any building or appliance on the grounds, or who shall carry on business or trading of any sort, or shall build any fishing stand or lead, or set any fish net within the limits of the reservation, or do any act to or on the grounds or buildings which would be recognized by law as a trespass.

(e) Definitions. Except as otherwise provided in subparagraph (6) of paragraph (b) of this section, whenever such a word as "vessel," "boat," "barge," "raft," or the like is used in this section, it shall include all types of floating things which may be subject to lockage. Failure to refer specifically to a type of floating thing by its name shall not mean exclusion thereof from applicability of this section.

§ 207.690 Yamhill Lock, Yamhill River, Oreg.; use, administration, and navigation. (a) The lock and all its appurtenances shall be in charge of the officer of the Corps of Engineers, United States Army, detailed for that duty by the Secretary of the Army. His representative at the locality shall be the lock master, who shall customarily receive his orders and instructions from the Engineer Officer in charge. In case of emergency, however, the lock master shall have authority to take such steps as may be immediately necessary without waiting for instructions from the Engineer Officer in charge, but shall inform him of such action as soon as practicable thereafter.

(b) The lock master shall be charged with the immediate control and management thereof, and of the grounds and public property pertaining thereto. He shall see that all laws, rules, and regulations for the use of the lock and grounds are duly complied with, to which end he is authorized to give all necessary orders and directions in accordance therewith, both to employees of the Government and to any and every person within the limits of the lock or the grounds pertaining thereto whether navigating the lock or not. In case of the absence or disability of the lock master his duty shall be performed by such other employee to be designated by the Engineer Officer in charge.

(c) The lock master is enjoined to be diligent and attentive in the performance of his duties, courteous but firm to all with whom he comes in contact, and never to lose sight of the fact that the purpose of his employment is to facilitate the use of the lock.

(d) Authority of lock master. No one shall cause any movement of any steamboat, barge, or other floating thing, in the lock, except by or under the direction of the lock master or his assistants.

(e) Signals. All steamboats desiring lockage shall signal the same by one long and two short blasts of the whistle, the signal for leaving the lock will be one short blast of the whistle.

(f) Use of lock. When two or more steamboats of the same class are ready at the same time to be passed through the lock they shall be passed through in the order in which they arrived and became so ready, unless it is otherwise directed by the lock master in immediate charge at the time. If boats are waiting at both ends of the lock, lockages will be made in alternate directions, unless the lock master in immediate charge at the time should decide that it would better facilitate navigation for them to be made otherwise.

(g) Entrance to locks. (1) The lock master in immediate charge shall decide whether one or more boats may be locked through at the same time, and no boat shall attempt to enter the lock until the signal to do so is given by the lock master. All boats shall run under "slow bell" when approaching or leaving the lock.

(2) No boat of any kind shall enter the lock drawing more water than is shown by the lock gages.

(h) Mooring in locks. When a boat is in the lock the person in charge of it shall fasten one head line, one spring line, and such other lines, as may be necessary to the snubbing hooks provided for the purpose, and the lines shall not be loosed until the signal is given for the boat to leave the lock.

(i) Delays. No person in charge of a boat shall permit it to in any way obstruct the locks or free navigation of the lock, or to delay in entering or leaving the lock after the proper signal is given; and the willful neglect of any lawful order by anyone in charge of a boat in the lock shall be construed as permitting the boat to obstruct the free navigation of the lock.

(j) Tows. Persons in charge of a boat having a tow shall take the same ahead or alongside at a distance of at least 300 feet from the gate nearest the end of the lock which the tow is approaching and keep it in such position until clear of the last gate at the end out of which it is passing.

(k) Mooring outside lock. Boats shall be moored to the lock walls or revetments by persons in charge of them only at such places as may be provided by the lock master, and then only in such a manner as not to interfere with navigation.

(l) Landing of freight. No one shall land freight or baggage on or over the walls of the lock so as to in any way delay or interfere with navigation or the operation of the lock; and freight and baggage consigned to Yamhill Lock shall be landed only at the place provided at the upper end of lock, or on the revetment below the lower end of west wall.

(m) Refuse in lock. No material of any kind shall be thrown or swept into lock.

(n) Injury to lock or fixtures. Persons in charge of boats must use great care to prevent them from striking any gate or appurtenance thereto; and no one shall take any boat into the lock or have one therein, which is not at the time free from projecting irons and rough surfaces that would be liable to damage the gates, lock walls, etc. All boats must be provided with suitable fenders.

(o) Handling the gates and machinery. No person, other than those duly authorized by the United States Engineer office in charge of the lock, shall open or close any valve or gate, or interfere with any mechanism or appliance connected with the operation of the lock, or located on the lock grounds, nor shall anyone interfere with the employees in the discharge of their duties, except that in case the lock master deems assistance necessary he may call therefor upon the master of any boat using the lock, and when so called upon such master shall render the assistance called for, or cause it to be rendered.

(p) Statistics. Master or pursers of vessels shall make to the lock master on each passage such written statement of passengers, freight, and registered tonnage as may be indicated by blanks approved by the Secretary of War, and furnished such masters or pursers by the lock master in charge.

(q) Trespass. No one shall trespass on the grounds or buildings, and everyone shall be deemed guilty of trespass within the meaning of this paragraph who shall willfully or carelessly damage or disfigure the lock or dam or any part thereof, or any building or appliance on the grounds, or who shall carry on any business or trading of any sort, or do any act to or on the grounds or buildings of the United States which would be recognized by law as a trespass.

§ 207.700 Bonneville Dam Navigation Lock and Approach Channels, Columbia River, Oregon and Washington; use, administration, and navigation. (a) General. The lock and its approach channels, and all its appurtenances, shall be in charge of the District Engineer, U.S. Army Engineer District, in charge of the locality. His representative at Bonneville Dam shall be the Project Engineer who shall customarily give orders and instructions to the lock master and assistant lock masters in charge of the lock. In this section, the term "lock master" shall be used to designate the lock official in immediate charge of the lock at any given time. In case of emergency and on all routine work in connection with the operation of the lock, the lock master shall have authority to take such steps as may be immediately necessary without waiting for instructions from the Project Engineer.

(b) Immediate control. The lock master shall be charged with the immediate control and management of the lock, and of the area set aside as the lock area, including the lock approach channels. He shall see that all laws, rules and regulations for the use of the lock and lock area are duly complied with, to which end he is authorized to give all necessary orders and directions

in accordance therewith, both to employees of the Government and to any and every person within the limits of the lock or lock area, whether navigating the lock or not. It shall be the duty of the Project Engineer to establish lines of succession for the men operating the lock on all shifts in order that in case of absence or accident to the designated lock master, one of his assistants will immediately assume the position of lock master.

(c) Authority of lock master. No one shall cause any movement of any vessel, boat, or other floating thing in the lock or approaches except by or under the direction of the lock master or his assistants.

(d) Signals—(1) Sound. All craft desiring lockage shall signal by two long and two short blasts of the whistle, delivered at a distance of one-half mile from the lock. When the lock is ready for entrance, notice will be given by one long blast. Permission to leave the lock will be given by one short blast.

(2) Visual. Lights are located at only the upstream end of the lock and will be used in conjunction with the sound signals for downstream bound traffic. When a green light is on, the lock is ready for entrance by all craft except log rafts, and vessels may enter under full control. When a red light is on, the lock cannot be made ready immediately and the vessel shall stand clear. When an amber light is on, log rafts only may enter the lock.

(3) Radio. The lock is equipped with two-way radio operating on frequencies of 2182 and 2784 kc. These frequencies will be monitored by the lock master. Vessels equipped with two-way radio may communicate with the crew operating the lock, but communications or signals so received will only augment and not replace the sound and visual signals.

(e) Permissible dimensions of boats. The lock chamber is 76 feet wide by 500 feet long in the clear. Single tows of lesser dimensions will be permitted to lock through without disassembly. If desired, a tow of dimensions greater than 76 feet by 500 feet may be rearranged to less than clear lock dimensions prior to entering the lock, and be passed through the lock in one lockage. Such rearrangements may be done at the moorage in the downstream lock approach channel or along the upstream guide wall if it will not interfere with other river traffic. If other river traffic will be hindered, upstream rearrangement should be done above the guide wall. During periods when other river traffic will not be held up, and, if in the opinion of the lock master vehicular and pedestrian traffic over the swing bridge or other Bonneville Project functions will not be appreciably affected, rearrangement of craft within the lock chamber will be permitted provided that rearrangement maneuvers will not result in barges or tugs wedging against or striking the miter gates in their recesses. Maneuvering of craft in the lock chamber will be permitted only when both miter gates at the open end of the lock are in their recesses in the block walls. Tows wider than 50 feet will not be permitted to enter the lock during extreme high water when tailwater at the lock is higher than 35 feet above m.s.l. since the downstream guide wall will be inundated at that stage and will offer no guidance.

(f) Depths. At normal pool elevation of 72 feet above m.s.l., the depth of water over the upstream miter gate sill will be 32 feet. The downstream miter gate sill has an elevation of 16 feet below m.s.l. The depth of water over the downstream miter gate sill will depend upon the flow in the river but will usually exceed 24 feet which would exist at a tailwater elevation of 8 feet above m.s.l. Gauges reading in elevation above m.s.l. are located on the south wall of the lock adjacent to each lock gate. A boat must not attempt to enter the lock if its draft exceeds the depth indicated by references to the gauges, with due allowances for clearance.

(g) Precedence at lock. Ordinarily the boat arriving before all others at the lock will be locked through first; however, depending upon whether the lock is full or empty, this precedence may be modified at the discretion of the lock master if boats are approaching from the opposite direction and are within reasonable distances of the lock at the time of the approach by the first boat. When several boats are to pass through the locks precedence shall be given as follows:

First: Boats and craft owned by the United States and engaged upon river and harbor improvement work.

Second: Freight and towboats.

Third: Rafts.

Fourth: Passenger boats.

Fifth: Small vessels and pleasure boats.

(h) Loss of turn. Boats that fail to enter the lock with reasonable promptness, after being authorized to do so, shall lose their turn.

(i) Multiple lockage. The lock master shall decide whether one or more vessels may be locked through at the same time.

(j) Speed. Vessels shall not be raced or crowded alongside another in the approach channels. When entering the lock, speed shall be reduced to a minimum consistent with safe navigation. As a general rule, when a number of vessels are entering the lock, the following vessels shall remain at least 200 feet astern of the vessel ahead.

(k) Lockage of small boats. In general the lockage of pleasure boats, skiffs, fishing boats, and other small craft will be coordinated with the lockage of commercial craft other than barges handling petroleum products or highly hazardous materials. If no combined lockage can be scheduled within a reasonable time not to exceed one hour after the arrival of the small craft at the lock, separate lockage will be made for such small craft.

(l) Mooring in lock. All boats, rafts and other craft when in the locks shall be moored by head and spring lines and such other lines as may be necessary to the fastenings provided for that purpose, and the lines shall not be let go until the signal is given for the vessel to leave the lock.

(m) Mooring in approaches prohibited. The mooring or anchoring of boats or other craft in the approaches to the lock where such mooring will interfere with navigation of the lock is prohibited. Rafts to be passed through the lock shall be moored in such a manner as not to interfere with the navigation of the lock or its approaches, and if the raft is to be divided into sections for locking,

the sections shall be brought into the lock as directed by the lock master. After passing through the lock, the sections shall be reassembled at such a distance from the entrance as not to obstruct or interfere with navigation of the lock and approaches.

(n) Waiting for lockage. Boats and tows waiting downstream of the dam for lockage shall wait in the clear downstream of the navigation lock approach channel, or contingent upon prior radio clearance of the lock master, may at their own risk lie at the downstream moorage facility on the south shore downstream from the guide wall, provided that a 100-foot wide open channel is maintained. Vessels waiting upstream of the dam for lockage may lay to against the guide wall provided they remain not less than 400 feet upstream of the upstream lock gate; or contingent upon prior radio clearance by the lock master they may tie to the upstream guide wall.

(o) Delay in lock. Boats or barges must not obstruct navigation by unnecessary delay in entering or leaving the lock.

(p) Damage to lock or other structures. The owners and masters of vessels shall be liable for any damage caused by their operation to the lock or other structures. They must use great care not to strike any part of the lock, any gate or appurtenance thereto, or machinery for operating the gates, or the walls protecting the banks of the approach channels. All boats with metal nosings or projecting irons, or rough surfaces that would be liable to damage the gates or lock walls, will not be permitted to enter the lock unless provided with suitable buffers and fenders.

(q) Tows. Persons in charge of a vessel that is towing a second vessel or barge by lines, shall take the second vessel or barge alongside at a distance of at least 500 feet from the lock and keep it alongside until at least 500 feet clear of the lock.

(r) Crew to move craft. The masters in charge of tows and the persons in charge of rafts and other craft must provide a sufficient number of men to move barges, rafts, and other craft into and out of the lock easily and promptly.

(s) Handling valves, gates, bridges, and machinery. No person, unless authorized by the lock master shall open or close any bridge, gate, valve, or operate any machinery in connection with the lock, but the lock master may call for assistance from the master of any boat using the lock, should such aid be necessary, and when rendering such assistance the men so employed shall be strictly under the orders of the lock master.

(t) Landing of freight. No one shall land freight or baggage on or over the walls of the lock so as in any way to delay or interfere with navigation or the operations of the lock; and freight and baggage consigned to Bonneville Project shall be landed only at such places as are designated by the lock master or his assistants.

(u) Refuse in lock. No material of any kind shall be thrown or discharged into the lock, and no material of any kind shall be deposited in the lock area.

(v) Statistics. On each passage through the lock, masters or pursers of vessels shall make to the lock master such written statement of passengers, freight, and registered tonnage and other information as are indicated on forms furnished such masters or pursers by the lock master.

(w) Persistent violation of regulations. If the owner or master of any boat persistently violates the regulations in this section after due notice of the same, the boat or master may be refused lockage by the lock master at the time of violation or subsequent thereto if deemed necessary in the opinion of the lock master to protect the Government property and works in the vicinity of the lock.

(x) Restricted areas. (1) All waters described in subparagraph (2) of this paragraph are restricted to all boats, except those of the United States Coast Guard and Corps of Engineers.

(2) All waters of the Columbia River and Bradford Slough within 1,000 feet above and 2,000 feet below the spillway dam and 500 feet above and 600 feet below the powerhouse are hereby designated as restricted areas. No vessel or other floating craft shall enter or remain in any of the restricted areas at any time without first obtaining permission from the District Engineer, U.S. Army Engineer District, Portland, or his duly authorized representative. The restricted areas will be designated by signs posted in conspicuous and appropriate places.

§ 207.705 Dalles Dam navigation lock and approach channels, Columbia River, Wash.; use, administration, and navigation. (a) General. The lock and its approach channels, and all its appurtenances, shall be in charge of the District Engineer, Corps of Engineers, United States Army, in charge of the locality. His representatives at the Dalles Dam shall be the Project Engineer who shall customarily give orders and instructions to the lock master and assistant lock masters in charge of the lock. In this section, the term "lock master" shall be used to designate the lock official in immediate charge of the lock at any given time. In case of emergency and on all routine work in connection with the operation of the lock, the lock master shall have authority to take such steps as may be immediately necessary without waiting for instructions from the Project Engineer.

(b) Immediate control. The lock master shall be charged with the immediate control and management of the lock, and of the area set aside as the lock area, including the lock approach channels. He shall see that all laws, rules and regulations for the use of the lock and lock area are duly complied with, to which end he is authorized to give all necessary orders and directions in accordance therewith, both to employees of the Government and to any and every person within the limits of the lock or lock area, whether navigating the lock or not. It shall be the duty of the Project Engineer to establish lines of succession for the men operating the lock on all shifts in order that in case of absence or accident to the designated lock master, one of his assistants will immediately assume the position of lock master.

(c) Authority of lock master. No one shall cause any movement of any vessel, boat, or other floating thing in

the lock or approaches except by or under the direction of the lock master or his assistants.

(d) Signals—(1) Sound. All craft desiring lockage shall signal by two long and two short blasts of the whistle, delivered at a distance of one-half mile from the lock. When the lock is ready for entrance, notice will be given by one long blast. Permission to leave the lock will be given by one short blast.

(2) Visual. Lights are located outside each lock gate and will be used in conjunction with the sound signals. When a green light is on, the lock is ready for entrance and vessels may enter under full control. When a red light is on, the lock cannot be made ready immediately and the vessel shall stand clear.

(3) Radio. The lock is equipped with two-way radio operating on frequencies of 2182 and 2784 kc. These frequencies will be monitored by the lock master. Vessels equipped with two-way radio may communicate with the crew operating the lock, but communications or signals so received will only augment and not replace the sound and visual signals.

(e) Permissible dimensions of boats. The lock chamber is 86 feet wide by 675 feet long in the clear. Single tows aggregating 650 feet in length will be permitted to lock through without disassembly. At normal pool elevation of 160 feet above m.s.l., the depth of water over the upstream miter gate sill will be 20 feet. The downstream miter gate sill has an elevation of 54.5 feet above m.s.l. The depth of water over the downstream miter gate sill will depend upon the flow in the river but will usually exceed fifteen feet. Gauges reading in elevation above m.s.l. are located on the north wall of the lock adjacent to each lock gate and at the end of the approach channel immediately downstream of the downstream gate. A boat must not attempt to enter the lock if its beam and length are greater than above indicated, or if its draft exceeds the depth indicated by reference to the gauges, with due allowance for clearance.

(f) Precedence at lock. Ordinarily the boat arriving before all others at the lock will be locked through first; however, depending upon whether the lock is full or empty, this precedence may be modified at the discretion of the lock master if boats are approaching from the opposite direction and are within reasonable distance of the lock at the time of the approach by the first boat. When several boats are to pass precedence shall be given as follows:

(1) First. Boats and craft owned by the United States and engaged upon river and harbor improvement work.

(2) Second. Freight and towboats.

(3) Third. Rafts.

(4) Fourth. Passenger boats.

(5) Fifth. Small vessels and pleasure boats.

(g) Loss of turn. Boats that fail to enter the lock with reasonable promptness, after being authorized to do so, shall lose their turn.

(h) Multiple lockage. The lock master shall decide whether one or more vessels may be locked through at the same time.

(i) Speed. Vessels shall not be raced or crowded alongside another in the approach channels. When entering the lock, speed shall be reduced to a minimum consistent with safe navigation. As a general rule, when a number of vessels are entering the lock, the following vessel shall remain at least 200 feet astern of the vessel ahead.

(j) Lockage of small boats. In general the lockage of pleasure boats, skiffs, fishing boats, and other small craft will be coordinated with the lockage of commercial craft other than barges handling petroleum products or highly hazardous materials. If no combined lockage can be scheduled within a reasonable time not to exceed one hour after the arrival of the small craft at the lock, separate lockage will be made for such small craft.

(k) Mooring in lock. All boats, rafts and other craft when in the locks shall be moored by head and spring lines and such other lines as may be necessary to the fastenings provided for that purpose, and the lines shall not be let go until the signal is given for the vessel to leave the lock.

(l) Mooring in approaches prohibited. The mooring or anchoring of boats or other craft in the approaches to the lock where such mooring will interfere with navigation of the lock is prohibited. Rafts to be passed through the lock shall be moored in such a manner as not to interfere with the navigation of the lock or its approaches, and if the raft is to be divided into sections for locking, the sections shall be brought into the lock as directed by the lock master. After passing through the lock, the sections shall be reassembled at such a distance from the entrance as not to obstruct or interfere with navigation of the lock and approaches.

(m) Waiting for lockage. Boats and tows waiting downstream of the dam for lockage shall wait in the clear downstream of the navigation lock approach channel, or, contingent upon prior radio clearance of the lock master, may at their own risk lie inside the approach channel alongside the offshore guard wall provided that a 100-foot wide open channel is maintained between the boat or tow and the guide wall on the Washington shore side. Vessels waiting upstream of the dam for lockage may lay to against the offshore guide wall provided they remain not less than 400 feet upstream of the upstream lock gate; or contingent upon prior radio clearance by the lock master they may tie to the upstream guide wall on the Washington shore. In either event, a clear channel not less than 100 feet wide shall be kept open to accommodate passing traffic.

(n) Delay in lock. Boats or barges must not obstruct navigation by unnecessary delay in entering or leaving the lock.

(o) Damage to lock or other structures. The regulations contained in this section shall not affect the liability of the owners and operators of vessels for any damage by their operations to the lock or other structures. They must use great care not to strike any part of the lock, any gate or appurtenance thereto, or machinery for operating the gates, or the walls protecting the banks of the approach channels. All boats with metal nosing or

projecting irons, or rough surfaces that would be liable to damage the gates or lock walls, will not be permitted to enter the lock unless provided with suitable buffers and fenders.

(p) Tows. Persons in charge of a vessel towing a second vessel or barge by lines, shall take the second vessel or barge alongside at a distance of at least 500 feet from the lock gate which the vessel is approaching and keep it alongside until at least 500 feet clear of the gate at the end from which it is passing.

(q) Crew to move craft. The masters in charge of tows and the persons in charge of rafts and other craft must provide a sufficient number of men to move barges, rafts and other craft into and out of the lock easily and promptly.

(r) Handling valves, gates, bridges, and machinery. No person, unless authorized by the lock master shall open or close any bridge, gate, valve, or operate any machinery in connection with the lock, but the lock master may call for assistance from the master of any boat using the lock, should such aid be necessary, and when rendering such assistance the men so employed shall be strictly under the orders of the lock master. Masters of boats refusing to give assistance when it is requested of them may be denied the use of the lock by the lock master.

(s) Landing of freight. No one shall land freight or baggage on or over the walls of the lock so as in any way to delay or interfere with navigation or the operations of the lock; and freight and baggage consigned to The Dalles project shall be landed only at such places as are designated by the lock master or his assistants.

(t) Refuse in lock. No material of any kind shall be thrown or discharged into the lock, and no material of any kind shall be deposited in the lock area.

(u) Statistics. On each passage through the lock, masters or pursers of vessels shall make to the lock master such written statement of passengers, freight, and registered tonnage and other information as are indicated on forms furnished such masters or pursers by the lock master.

(v) Persistent violation of regulations. If the owner or master of any boat persistently violates the regulations of this section after due notice of the same, the boat or master may be refused lockage by the lock master at the time of violation or subsequent thereto if deemed necessary in the opinion of the lock master to protect the Government property and works in the vicinity of the lock.

(w) Restricted areas. (1) All waters described in subparagraphs (2) and (3) of this paragraph are restricted to all boats except those of the United States Coast Guard and Corps of Engineers.

(2) All downstream waters other than those of the Navigation Lock Downstream Approach Channel which lie between the Wasco County Bridge and the project axis including those waters between the powerhouse and the Oregon shore.

(3) All upstream waters other than those of the Navigation Lock Upstream Approach Channel which lie between the project axis and a line projected from the upstream end of the Navigation Lock Guide Wall to the junction of the concrete structure with the earth fill section of dam near the upstream end of the powerhouse.

§ 207.715 McNary Dam Navigation Lock and approach channels, Columbia River, Washington; use, administration, and navigation. (a) General. The lock and its approach channels, and all its appurtenances, shall be in charge of the District Engineer, Corps of Engineers, United States Army, in charge of the locality. His representative at McNary Dam shall be the Project Engineer who shall customarily give orders and instructions to the lock master and assistant lock masters in charge of the lock. Hereinafter, the term "lock master" shall be used to designate the lock official in immediate charge of the lock at any given time. In case of emergency and on all routine work in connection with the operation of the lock, the lock master shall have authority to take such steps as may be immediately necessary without waiting for instructions from the Project Engineer.

(b) Immediate control. The lock master shall be charged with the immediate control and management of the lock, and of the area set aside as the lock area, including the lock approach channels. He shall see that all laws, rules, and regulations for the use of the lock and lock area are duly complied with, to which end he is authorized to give all necessary orders and directions in accordance therewith, both to employees of the Government and to any and every person within the limits of the lock or lock area, whether navigating the lock or not. It shall be the duty of the Project Engineer to establish lines of succession for the men operating the lock on all shifts in order that in case of absence or accident to the designated lock master, one of his assistants will immediately assume the position of lock master.

(c) Authority of lock master. No one shall cause any movement of any vessel, boat, or other floating thing in the lock or approaches except by or under the direction of the lock master or his assistants.

(d) Signals—(1) Sound. All craft desiring lockage shall signal by two long and two short blasts of the whistle, delivered at a distance of one-half mile from the lock. When the lock is ready for entrance, notice will be given by one long blast. Permission to leave the lock will be given by one short blast.

(2) Visual. Visual signals are located outside each lock gate and will be used in conjunction with the sound signals. When the green semaphore arm is up or a green light is on, the lock is ready for entrance and vessels may enter under full control. When the red semaphore arm is up or a red light is on the lock cannot be made ready immediately and the vessel shall stand clear.

(3) Radio. The lock is equipped with two-way radio operating on a frequency of 2738 kc. The frequency is monitored by the lock master. Vessels equipped with two-way radio may communicate with the crew operating the lock but communications or signals so received will only augment and not replace the sound and visual signals.

(e) Permissible dimensions of boats. The lock chamber is 86 feet wide by 683.5 feet long in the clear. Single tows aggregating 675 feet in length will be permitted to lock through without disassembly. At normal pool elevation of 340 feet above m.s.l., the depth of water over the upstream miter gate sill will be 20 feet. The depth of water over the downstream miter gate sill will depend upon the flow in the river but will usually exceed 14 feet. Gauges are located on the south wall of the lock adjacent to each miter gate and at the end of the approach channel immediately downstream of the downstream miter gate. The gauges indicate the depth of water over the downstream miter gate sill. A boat must not attempt to enter the lock if its beam and length are greater than above indicated, or if its draft exceeds the depth indicated by the gauges, with due allowance for clearance.

(f) Precedence at lock. Ordinarily the boat arriving before all others at the lock will be locked through first; however, depending upon whether the lock is full or empty, this precedence may be modified at the discretion of the lock master if boats are approaching from the opposite direction and are within reasonable distance of the lock at the time of the approach by the first boat. When several boats are to pass precedence shall be given as follows:

First: Boats and craft owned by the United States and engaged upon river and harbor improvement work.

Second: Rafts.

Third: Freight and tow boats.

Fourth: Passenger boats.

Fifth: Small vessels and pleasure boats.

(g) Loss of turn. Boats that fail to enter the lock with reasonable promptness, after being authorized to do so, shall lose their turn.

(h) Multiple lockage. The lock master shall decide whether one or more vessels may be locked through at the game time.

(i) Speed. Vessels shall not be raced or crowded alongside another in the approach channels. When entering the lock, speed shall be reduced to a minimum consistent with safe navigation. As a general rule, when a number of vessels are entering the lock the following vessel shall remain at least 200 feet astern of the vessel ahead.

(j) Lockage of small boats—(1) General. The lockage of pleasure boats, skiffs, fishing boats, and other small craft will be coordinated with the lockage of commercial craft. If no commercial craft are scheduled to be locked through within a reasonable time not to exceed one hour after the arrival of the small craft at the lock, separate lockage will be made for such small craft.

(2) Signals. Signals stations which are connected to a horn located on the lock are located on the upstream and downstream guidewalls to provide facilities for small boats to notify the lockmaster they desire lockage through the lock. The upstream station is located near the upstream end of the north guidewall. The downstream station is located near the first ladded on the north guidewall about 400 feet below the mitre gate. Small boats desiring to use the lock will sound two long and two short blasts of the horn. When the lock is ready for entrance, the lockmaster will notify the small boat by one long blast of the horn. Permission to leave the lock will be given by one short blast of the horn.

(k) Mooring in lock. All boats, rafts and other craft when in the locks shall be moored by head and spring lines and such other lines as may be necessary to the fastenings provided for that purpose, and the lines shall not be let go until the signal is given for the vessel to leave the lock.

(l) Mooring in approaches prohibited. The mooring or anchoring of boats or other craft in the approaches to the lock where such mooring will interfere with navigation of the lock is prohibited. Rafts to be passed through the lock shall be moored in such a manner as not to interfere with the navigation of the lock or its approaches, and, if the raft is to be divided into sections for locking, the sections shall be brought into the lock as directed by the lock master. After passing through the lock, the sections shall be reassembled at such a distance from the entrance as not to obstruct or interfere with navigation of the lock and approaches.

(m) Waiting for lockage. Boats and tows waiting for lockage downstream of the dam may wait alongside the moorage wall provided that the 250-foot-wide channel between the moorage wall and downstream guard wall is not restricted to less than 150-foot width at any point by such moorage. Vessels waiting for lockage upstream of the dam may wait in the area between a line 200 feet north of the upstream guard wall and the Washington shore; or they may tie to the upstream guard wall at points at least 800 feet upstream of the upstream lock gate.

(n) Delay in lock. Boats or barges must not obstruct navigation by unnecessary delay in entering or leaving the lock.

(o) Damage to lock or other structures. The regulations contained in this section shall not effect the liability of the owners and operators of vessels for any damage by their operations to the lock or other structures. They must use great care not to strike any part of the lock, any gate or appurtenance thereto, or machinery for operating the gates or the walls protecting the banks of the approach channels. All boats with metal nosings or projecting irons, or rough surfaces that would be liable to damage the gates or lock walls, will not be permitted to enter the lock unless provided with suitable buffers and fenders.

(p) Tows. Persons in charge of a vessel towing a second vessel or barge by lines, shall take the second vessel or barge alongside at a distance of at least 300 feet from the lock gate which the vessel is approaching and keep it alongside until at least 300 feet clear of the gate at the end from which it is passing.

(q) Crew to move craft. The masters in charge of tows and the persons in charge of rafts and other craft must provide a sufficient number of men to move barges, rafts and other craft into and out of the lock easily and promptly.

(r) Handling valves, gates, bridges, and machinery. No person, unless authorized by the lock master shall open or close any bridge, gate, valve, or operate any machinery

691-231 O—63——6

in connection with the lock, but the lock master may call for assistance from the master of any boat using the lock, should such aid be necessary, and when rendering such assistance the men so employed shall be strictly under the orders of the lock master. Masters of boats refusing to give assistance when it is requested of them may be denied the use of the lock by the lock master.

(s) Landing of freight. No one shall land freight or baggage on or over the walls of the lock so as in any way to delay or interfere with navigation or the operations of the lock; and freight and baggage consigned to McNary project shall be landed only at such places as are designated by the lock master or his assistants.

(t) Refuse in lock. No material of any kind shall be thrown or discharged into the lock, and no material of any kind shall be deposited in the lock area.

(u) Statistics. On each passage through the lock, masters or pursers of vessels shall make to the lock master such written statement of passengers, freight, and registered tonnage and other information as are indicated on forms furnished such masters or pursers by the lock master.

(v) Persistent violation of regulations. If the owner or master of any boat persistently violates these regulations after due notice of the same, the boat or master may be refused lockage by the lock master at the time of violation or subsequent thereto if deemed necessary in the opinion of the lock master to protect the Government property and works in the vicinity of the lock.

(w) Restricted areas. (1) All waters described in subparagraphs (2) and (3) of this paragraph are restricted to all boats except those of the United States Coast Guard and Corps of Engineers.

(2) All of the waters downstream of the dam which are bounded on the east by the dam, on the north by a guardwall, on the south by the shore of the river and on the west by a line approximately ¾ mile downstream of the dam, the north end of which is indicated by red and white squares painted on rocks on the Washington shore and the south end of which is marked by a tetrahedron on the Oregon shore. The riverside face of the tetrahedron is painted with red and white squares.

(3) All waters within a distance of about 3,000 feet above the dam lying south of the guardwall and a line extending about 1,600 feet from the upstream end of the guardwall to a buoy, and north of a line marked by a series of three nun buoys approximately parallel to and 800 feet from the Oregon shore.

§ 207.716 Ice Harbor Dam Navigation Lock and Approach Channels, Snake River, Wash.; use, administration, and navigation. (a) General. The lock and its approach channels, and all its appurtenances, shall be under the jurisdiction of the District Engineer, Corps of Engineers, United States Army, in charge of the locality. His representative at Ice Harbor Dam shall be the Project Engineer, who shall customarily give orders and instructions to the lock master and assistant lock masters in charge of the lock. Hereinafter, the term "lock master" shall be used to designate the lock official in immediate charge of the lock at any given time. In case of emergency and on all routine work in connection with the operation of the lock, the lock master shall have authority to take such steps as may be immediately necessary without waiting for instructions from the Project Engineer.

(b) Immediate control. The lock master shall be charged with the immediate control and management of the lock, and of the area set aside as the lock area, including the lock approach channels. He shall see that all laws, rules, and regulations for the use of the lock and lock area are duly complied with, to which end he is authorized to give all necessary orders and directions, both to employees of the Government and to any and every person within the limits of the lock or lock area, whether navigating the lock or not. It shall be the duty of the Project Engineer to establish lines of succession for the men operating the lock on all shifts in order that in case of absence or accident to the designated lock master, one of his assistants will immediately assume the position of lock master.

(c) Authority of lock master. No one shall cause any movement of any vessel, boat, or other floating thing in the lock or approaches except by or under the direction of the lock master or his assistants.

(d) Signals—(1) Sound. All craft desiring lockage shall signal by two long and two short blasts of their whistle, delivered at a distance of one-half mile from the lock. When the lock is ready for entrance, notice will be given by one long blast. Permission to leave the lock will be given by one short blast.

NOTE: Signal stations are provided at the upstream and downstream guide walls for use of small craft not equipped with signal equipment.

(2) Visual. Visual signals are located outside each lock gate and will be used in conjunction with the sound signals. When the green light is on, the lock is ready for entrance and vessels may enter under full control. When the red light is on, the lock cannot be made ready immediately and the vessel shall stand clear.

(3) Radio. The lock is equipped with two-way radio operating on frequencies of 2784 and 2182 kc. These frequencies are monitored by the lock master. Vessels equipped with two-way radio may communicate with the crew operating the lock but communications or signals so received will only augment and not replace the sound and visual signals.

(e) Permissible dimensions of boats. The lock chamber is 86 feet wide by 664.5 feet long in the clear. Single tows aggregating 650 feet or less in length will be permitted to lock through without disassembly. At normal pool elevation of 440 feet above m.s.l., the depth of water over the upstream gate sill will be 18 feet. The upstream sill elevation is 422 feet m.s.l. The depth of water over the downstream gate sill will depend upon the flow in the river but will usually exceed 19 feet when McNary Pool is at 340 feet m.s.l. The downstream gate sill elevation is 321 feet m.s.l. Gauges are located on the guide walls at each end of the lock and on the lock walls at each end. These gauges indicate water surface elevations in feet above m.s.l. Depth of water over the sills should

be calculated before entrance into the lock. A craft must not attempt to enter the lock if its beam and length are greater than the above-indicated dimensions or if its draft exceeds the calculated depth over the sills with adequate allowances for safe clearances.

(f) Precedence at lock. Ordinarily the boat arriving before all others at the lock will be locked through first; however, depending upon whether the lock is full or empty, this precedence may be modified at the discretion of the lock master if boats are approaching from the opposite direction and are within reasonable distance of the lock at the time of the approach by the first boat. When several boats are to pass, precedence shall be given as follows:

First. Boats and craft owned by the United States and engaged upon river and harbor improvement work.

Second. Freight and towboats.

Third. Rafts.

Fourth. Passenger boats.

Fifth. Small vessels and pleasure craft.

(g) Loss of turn. Boats that fail to enter the lock with reasonable promptness, after being authorized to do so, shall lose their turn.

(h) Multiple lockage. The lock master shall decide whether one or more vessels may be locked through at the same time.

(i) Speed. Vessels shall not be raced or crowded alongside another in the approach channels. When entering the lock, speed shall be reduced to a minimum consistent with safe navigation. As a general rule, when a number of vessels are entering the lock, the following vessel shall remain at least 200 feet astern of the vessel ahead.

(j) Lockage of small boats—(1) General. The lockage of pleasure boats, skiffs, fishing boats, and other small craft will be coordinated with the lockage of commercial craft, other than barges handling petroleum products or highly hazardous materials. If no commercial craft are scheduled to be locked through within a reasonable time not to exceed one hour after the arrival of the small craft at the lock, separate lockage will be made for such small craft.

(2) Signals. Signal stations which are connected to a bell located at the lock are located on the upstream and downstream guidewalls to provide facilities for small boats to notify the lock master they desire lockage. The upstream station is located near the upstream end of the north guidewall. The downstream station is located on the north guidewall about 400 feet below the gate. Small boats desiring to use the lock will sound two long and two short rings of the bell for upstream lockage and two long and three short rings for downstream lockage. When the lock is ready for entrance, the lock master will notify the small boat by one long blast of the horn. Permission to leave the lock will be given by one short blast of the horn. The boat will wait at the signal station until the lock master signals to enter.

(k) Mooring in lock. All boats, rafts, and other craft when in the locks shall be moored by head and spring lines and such other lines as may be necessary to the fastenings provided for that purpose, and the lines shall not be released until the signal is given for the vessel to leave the lock. (Do not moor to stationary bits or ladders.)

(l) Mooring in approaches prohibited. The mooring or anchoring of boats or other craft in the approaches to the lock where such mooring will interfere with navigation through the lock is prohibited. Rafts to be passed through the lock shall be moored so as not to interfere with the navigation through lock or its approaches, and, if the raft is to be divided into sections for locking, the sections shall be brought into the lock as directed by the lock master. After passing through the lock, the sections shall be reassembled at such a distance from the entrance so as not to obstruct or interfere with navigation through the lock and approaches.

(m) Waiting for lockage. Boats and tows waiting downstream of the dam for lockage shall wait in the clear downstream of the navigation lock approach channel, or, contingent upon prior radio clearance of the lock master, may at their own risk lie inside the 250-foot approach channel alongside the north shore, provided that a 150-foot-wide open channel is maintained between the boat or tow and the offshore guidewall. Vessels waiting upstream of the dam for lockage may lay to against the offshore floating guidewall provided they remain not less than 400 feet upstream of the upstream lock gate. In either event, a clear channel not less than 150 feet wide shall be kept open to accommodate passing traffic.

(n) Delay in lock. Boats or barges must not obstruct navigation by unnecessary delay in entering or leaving the lock.

(o) Damage to lock or other structures. The regulations contained in this section shall not affect the liability of the owners and operators of vessels for any damage by their operations to the lock or other structures. They must use great care not to strike any part of the lock, any gate or appurtenance thereto, or machinery for operating the gates, or the walls protecting the banks of the approach channels. All boats with metal nosings or projecting irons, or rough surfaces which may damage the gates or lock walls, will not be permitted to enter the lock unless provided with suitable buffers and fenders.

(p) Tows. Persons in charge of vessel towing a second vessel or barge by lines, shall take the second vessel or barge alongside at a distance of at least 300 feet from the lock gate toward which the vessel is approaching and keep it alongside until at least 300 feet clear of the gate at the end from which it is departing.

(q) Crew to move craft. The masters in charge of tows and the persons in charge of rafts and other craft must provide a sufficient number of men to move barges, rafts, and other craft into and out of the lock easily and promptly.

(r) Handling valves, gates, bridges, and machinery. No person, unless authorized by the lock master, shall open or close any bridge, gate, valve, or operate any machinery in connection with the lock, but the lock master may call for assistance from the master of any boat using the lock, should such aid be necessary, and when rendering such assistance, the men so employed shall be strictly under the orders of the lock master. Masters of

boats refusing to give such assistance when it is requested of them may be denied the use of the lock by the lock master.

(s) Landing of freight. No one shall land freight or baggage on or over the walls of the lock so as in any way to delay or interfere with navigation or the operations of the lock. Freight and baggage consigned to Ice Harbor Project shall be landed only at such places as are designated by the lock master or his assistants.

(t) Refuse in locks. No material of any kind shall be thrown or discharged into the lock, and no material of any kind shall be deposited in the lock area.

(u) Statistics. On each passage through the lock, masters or pursers of vessels shall make to the lock master such written statement of passengers, freight, and registered tonnage and other information as are indicated on forms furnished such masters or pursers by the lock master.

(v) Persistent violation of regulations. If the owner or master of any boat persistently violates the regulations of this section after due notice of the same, the boat or master may be refused lockage by the lock master at the time of violation or subsequent thereto if deemed necessary in the opinion of the lock master to protect Government property and works in the vicinity of the lock.

(w) Restricted areas. (1) All the waters described in subparagraphs (2) and (3) of this paragraph are restricted to all boats except those of the United States Coast Guard and Corps of Engineers.

(2) All of the waters downstream of the dam which are bounded on the east by the dam, on the north by the guidewall, on the south by the shore of the river, and on the west by a line approximately one-fourth mile downstream of the dam, the north end of which is indicated by the downstream end of the guidewall and on the south by the downstream transmission line tower.

(3) All waters within a distance of about 2,400 feet above the dam lying south of the navigation channel leading to the lock. This restricted area is marked by a line of buoys extending 1,800 feet upstream from the end of the floating guidewall, and thence, across the river to the south shore.

§ 207.720 Willapa Bay and tributaries, Wash.; logging. (a) The floating of loose logs, or sack rafts of timber and logs, is prohibited in Willapa Bay and at or below points on tributary streams as specified in the following list:

North Fork of Willapa River, below Willapa city.

South Fork of Willapa River, below a point 1 mile above the Northern Pacific Railway bridge.

North River, below the lower end of McGowan's boom, about 1 mile above mouth.

Smith Creek, at its mouth.

Querquellin River, at its mouth.

Palix River, at its mouth.

North Nemah River, below the boom of the Nemah River Logging Co., about 1 mile above mouth.

South Nemah River, at its mouth.

Nasel River, below Nasel boom, about 3 miles above mouth.

Bear River, below new county bridge, about 3 miles above mouth.

(b) Hemlock logs that will not float with at least 6 inches of butt out of water shall not be floated in any of the streams tributary of Willapa Bay, and no boat shall tow any raft containing any log of this character, unless such log is securely fastened so as to prevent its escape from the raft.

§ 207.730 Grays Harbor and tributaries, Wash.; logging. (a) Before operating on Grays Harbor or tributary streams all loggers, river drivers, log towboats, and log towboat companies shall register at the United States Engineer Office, Seattle, Wash., giving the firm name, name of manager, and post office address. They shall also register annually thereafter on July 1 of each year.

(b) No logs shall be dumped into the rivers or released from storage or sorting booms without being turned over to a registered driving or towboat company, firm, or individual.

(c) River drivers authorized to operate on the streams tributary to Grays Harbor must maintain a sufficient organization of boats and experienced workmen to care for the drivers of their customers.

(d) River drivers shall so conduct their operations that all parts of the rivers upon which they operate will be effectively patrolled and the formation of jams prevented.

(e) Should a blockade of logs occur below the head of tidewater in any of the rivers at any time, each logger operating on the river above the location of said blockade shall discontinue dumping logs into the river until the blockade shall be broken.

(f) Log drivers must not indifferently operate or delay the transit of logs.

(g) Loggers who entrust their logs to river drivers will be required to satify themselves that their logs are being driven in accordance with this section.

(h) The floating of loose logs or of sack rafts of timber and logs is prohibited in the Chehalis River below Preachers Slough; in the Hoquiam River below the forks; and also in the Wishkah River below a point 4 miles above the mouth.

(i) The floating of rafts or tows of timber and logs which exceed 700 feet in length and 60 feet in width is prohibited in the Chehalis River between the Oregon-Washington Railroad Co. bridge at Aberdeen and the Northern Pacific Railroad Co. bridge at Cosmopolis, and also in the Hoquiam River below the forks; and the floating of rafts or tows of timber and logs which extend 700 feet in length and 55 feet in width is prohibited in the Wishkah River below the North Aberdeen Bridge.

(j) Hemlock logs that will not float with at least 6 inches of butt out of water shall not be floated in any of the streams tributary to Grays Harbor, and no boat shall

tow any raft containing any log of this character unless such log is securely fastened so as to prevent its escape from the raft.

§ 207.750 Puget Sound Area, Wash. (a) Strait of Juan de Fuca, eastern end; naval restricted area—(1) The area. Off the westerly shore of Whidbey Island, bounded by a line commencing at N. latitude 48°18′30″, W. longitude 122°42′56″; thence approximately 312° true one mile to N. latitude 48°19′11″, W. longitude 122°44′05″; thence approximately 25° true to N. latitude 48°23′01″, W. longitude 122°41′21″; thence approximately 88° true one mile to N. latitude 48°23′02″, W. longitude 122°39′48″; thence along the shoreline to the point of beginning.

(2) The regulations. No vessel other than naval vessels shall enter the area or navigate therein without permission of the Commandant, Thirteenth Naval District, or his authorized representative.

(b) Oak Harbor and Crescent Harbor, Whidbey Island; naval restricted area—(1) The area. Beginning at Point Polnell at N. latitude 48°16′21″, W. longitude 122°33′27″; thence approximately 179°, 1.3 miles through the Point Polnell buoy to N. latitude 48°15′, W. longitude 122°33′24″; thence approximately 239°, 1.3 miles to N. latitude 48°14′24″, W. longitude 122°35′; thence approximately 272°, 1.7 miles to N. latitude 48°14′30″, W. longitude 122°37′30″; thence approximately 339°, 2.45 miles to N. latitude 48°16′48″, W. longitude 122°38′50″; thence approximately 44°, 0.75 mile to the shore in Oak Harbor; thence along the high water line of Oak Harbor, Forbes Point, and Crescent Harbor to the point of beginning.

(2) The regulations. No vessel shall enter this area or navigate therein without permission of the Commandant, Thirteenth Naval District, or his authorized representative.

(c) Admiralty Inlet, entrance; naval restricted area—(1) The area. Beginning at Point Wilson Light thence southwesterly along the coast line to latitude 48°07′ N.; thence northwesterly to a point at latitude 48°15′ N., longitude 123°00′ W.; thence due east to Whidbey Island; thence southerly along the coast line to latitude 48°12.5′ N.; thence southerly to the point of beginning.

(2) The regulations. (i) Use of any equipment such as anchors, fishing gear, grapnels, etc., which may foul underwater installations within the restricted area, is prohibited. Dumping of any non-buoyant objects in this area is prohibited.

(ii) The regulations of this paragraph shall be enforced by the Commandant, Thirteenth Naval District, or his duly appointed representative.

(d) Waterway connecting Port Townsend and Oak Bay; use, administration, and navigation—(1) Works to which regulations apply. The "canal grounds" when used in this paragraph shall mean that area between the south end of the jetties in Oak Bay and the northerly end of the dredge channel approximately 400 yards northwest of Port Townsend Canal Light. The "canal" is the water lying between these limits and the banks containing the same.

(2) Speed. The speed limit within the canal grounds shall not exceed five miles per hour.

(3) Signals. All boats desiring to use the canal shall give one long and one short whistle. Southbound boats shall sound the signal within 600 yards of Port Townsend Canal Light. Northbound boats shall sound this signal at least 500 feet south from the end of the jetties in Oak Bay. If no other boat answers the signal the first boat shall have the right of way through the canal. Any approaching boat that is in the canal shall answer by giving the same signal and the first boat shall not enter the canal until the second boat shall have passed through the canal. In the case of boats going in the same direction the boat which is in the canal shall not answer the signal of the boat desiring to enter.

(4) Passing. Steamers shall not under any circumstances attempt to pass each other in the canal, either when going in the same or opposite directions.

(5) Anchoring. No steamers or boats shall anchor or tie up within the canal grounds unless they are well over on the tide flats to the west of the dredged channel, and off the right of way belonging to the United States.

(6) Tows. No tow shall enter or pass through the canal with a towline more than 200 feet in length.

(7) Statistics. At the end of each month masters or clerks of vessels or boats that have used the canal during the month shall report to the District Engineer, U.S. Army Engineer District, Seattle, upon prescribed forms, a statement of passengers, freight, and registered tonnage, and such other statistical information as may be required by the blank forms which are issued to them for that purpose.

(8) Trading, landing, etc. No business, loading, or landing of freight or baggage will be allowed on or over the canal piers or bulkheads.

(9) Refuse. No person shall throw material of any kind into the canal.

(10) Delaying traffic. No person shall cause or permit any vessel or boat of which he is in charge, or on which he is employed, to obstruct the canal in any way or delay in passing through it.

(11) Obstructions. On the canal's being obstructed by a vessel, raft, or other craft, by sinking, grounding, or otherwise, the District Engineer, Seattle, shall be notified by telephone or telegraph as soon as possible by the person in charge of the obstructing vessel, raft, or craft.

(e) Hood Canal, Bangor; naval restricted area—(1) The area. All waters within 500 yards of the Navy pier and mooring buoys Nos. 1, 2, 3, and 4, lying southerly thereof, and all remaining waters along the easterly shore of Hood Canal within 200 feet of the high water line between latitude 47°46′20″ and latitude 47°43′28″. The buoys are located in the following positions: Buoy No. 1, latitude 47°44′37.5″, longitude 122°43′49″; buoy No. 2, latitude 47°44′32″, longitude 122°43′55″; buoy No. 3, latitude 47°44′29″, longitude 122°44′03″; buoy No. 4, latitude 47°44′25.5″, longitude 122°44′10″.

(2) The regulations. No vessel shall enter this area

without permission from the Commandant, Thirteenth Naval District, or his authorized representative.

(f) Puget Sound, Point Jefferson; naval restricted area—(1) The area. Shoreward of a line beginning at a point on shore about 340° and 480 yards from the Navy dock between Point Jefferson and President Point; thence about 90° and 1,000 yards to Buoy A; thence about 103° and 950 yards to Buoy B; thence about 195° and 2,000 yards to Buoy C; thence about 283° and 950 yards to Buoy D; thence about 283° and 850 yards to Point Jefferson. A small boat fairway has been established within the area and is bounded by a line beginning at a point on shore about 340° and 480 yards from the Navy dock between Point Jefferson and President Point; thence about 90° and 1,000 yards to Buoy A; thence about 195° and 2,000 yards to Buoy D; thence about 283° and 850 yards to Point Jefferson; thence about 51° and 1,050 yards; thence about 335° and 1,200 yards to shore.

(2) *The regulations.* (i) Except as modified for the small boat fairway, no vessel shall enter or navigate within the area without permission from the enforcing agency. Whenever the degaussing ranges are not in actual operation, the small boat fairway will be open to small boats and pleasure craft, but is closed at all times to other vessels and tows, fishing, and anchoring. Flashing red lights directed toward the northern and southern entrances to this fairway are mounted on the dock and at Range "B" respectively. When energized, these lights indicate that the small boat fairway is closed to transit.

(ii) The regulations in this paragraph shall be enforced by the Commandant, Thirteenth Naval District, and such agencies as he may designate.

(g) Lake Washington Ship Canal; use, administration, and navigation—(1) Definitions. The term "canal" as used in the regulations in this paragraph shall include the water area in the locks and the channel and adjacent waters from a point 5,500 feet northwest of the Great Northern Railway Company bridge to the east end of the channel opposite Webster Point, Lake Washington. The term "canal grounds" shall include all grounds set aside for the use of the canal or occupied in its construction.

(2) Supervision. The canal and all its appurtenances shall be in charge of the District Engineer, U.S. Army Engineer District, Seattle. The District Engineer will detail as many assistants as may be necessary for the efficient operation of the canal and the enforcement of the regulations in this paragraph. The movement of all vessels and other floating things in the canal and approaches thereto shall be under the direction of the District Engineer and his authorized assistants. All orders given under the regulations to any master or person in charge of any vessel, raft, or other watercraft by the District Engineer or his authorized assistants, either in person or through any canal operative, shall be acknowledged and obeyed. Failure to see, understand, or comply with signals or instructions shall constitute a violation of the regulations. Any person refusing to comply with the regulations or any orders given in pursuance thereof may be denied the privileges of the canal or canal grounds.

(3) Speed. To avoid damage to other vessels and to property along the shores, all vessels shall proceed at reduced speed in the canal as follows:

(i) From the west entrance of the Lake Washington Ship Canal to the western end of the west guide pier of the Hiram M. Chittenden Locks, and from the east end of the easternmost guide pier of said Locks to the white flashing dolphin located south of Webster Point on Lake Washington, including all of Salmon Bay, Lake Union, Portage Bay, and Union Bay, it shall be unlawful for any person to operate any watercraft or vessel at a speed in excess of 7 nautical miles per hour within 200 feet of any shoreline, pier, restricted area or shore installation.

(ii) From the western end of the aforesaid west guide pier to the eastern end of the aforesaid east guide pier at said Locks, it shall be unlawful for any person to operate any watercraft or vessel at a speed in excess of 4 nautical miles per hour.

NOTE: Signs are located along the canal to indicate permissible speeds.

(4) Traffic signal lights. In addition to the lock signal lights described in subparagraph (5)(ii) of this paragraph, a red light, and a green light are installed on the west side of the Ballard Bridge, on the east side of the Fremont Bridge, 1,000 feet west of the Montlake Bridge, and 1,000 feet east of the Montlake Bridge, for the guidance of vessels approaching the sections of the canal between Salmon Bay and Lake Union and between Lake Union and Lake Washington, respectively. Vessels of 300 gross tons and over and all vessels with tows, except as hereinafter provided, shall not pass the red lights. The green lights will indicate that vessels may proceed. Vessels of less than 300 gross tons without tows may disregard these signals, but they shall travel at very slow speed when passing other vessels. Vessels of 300 gross tons and over and vessels with tows, except logs, whose destination is between the Ballard Bridge and the Northern Pacific Railway Company bridge, may pass the red signals on the Ballard Bridge: Provided, such passage will not interfere with approaching traffic from Lake Union.

(5) Approaching and passing through locks—(i) Signals for locks. Vessels with tows desiring to use the locks shall so indicate by two long and three short blasts of a whistle, horn, or megaphone. All other vessels desiring to use the locks shall so indicate by two long and two short blasts.

NOTE: The term "long blasts" means blasts of four seconds' duration, and the term "short blasts" means blasts of one second's duration. Signals for the opening of drawbridges are prescribed in § 203.795 of this chapter.

(ii) Lock signal lights. Red and green signal lights are installed on the guide pier west of the Great Northern Railway Company bridge below the locks. The green light will indicate to vessels bound for the large lock that the lock has been made ready. If the red light is burning, vessels bound for the large lock shall moor at the pier. Vessels bound for the small lock shall obtain instructions from the pierman on the end of the pier as to which lock to use and shall be guided into the small lock

by traffic signals thereon. The masters of all vessels approaching the locks from Puget Sound shall be alert to receive and shall immediately comply with instructions by voice or signal from the employee on the west pier.

(iii) Precedence at locks. All vessels approaching the locks shall stop at the points indicated by signs placed on the canal piers or as directed by a lockman until ordered to proceed into the lock. Unless otherwise directed by the District Engineer or his authorized assistants, vessels owned or operated by the United States or the City of Seattle and passenger vessels operating on a regular schedule shall have precedence over all others in passing through the locks. Registered merchant vessels shall have precedence over pleasure craft, which shall pass through in the order of their arrival at the locks, and both shall have precedence over vessels towing floated timber or logs. Tows of floated timber and logs may be denied the use of the locks during certain hours when both locks are busy passing other traffic. However, advance notice will be given towboat companies as to the periods when the log tows will be denied lockage.

(iv) Entering locks. Masters of vessels shall exercise the greatest care when entering either lock. The forward movement of vessels while taking position in the locks shall be very slow, and boats entering the small lock shall reduce their speed to not more than two and one-half miles per hour when within 200 feet of the outer gate and come to practically a full stop before entering the lock so that in case the engine mechanism fails to operate properly the momentum of the boat may be stopped easily by its lines. The masters of vessels entering either lock from either direction shall be alert to receive and shall immediately comply with instructions by voice or signal from the lock attendants.

(v) Mooring in locks. Vessels and rafts while in the lock shall be moored at the top of the lock wall, adequate lines at least 50 feet in length being required fore and aft. Lines shall not be released until the signal has been given by the lock force to leave the lock, after which there shall be no delay in leaving. All vessels not equipped to handle tie-up lines with power winches shall be equipped with suitable mooring lines of manila or other suitable fiber, of sufficient size and strength to hold the vessel against the currents to be met within the lock chamber. The use of wire rope for tie-up lines by vessels not equipped to handle such lines with power winches is prohibited. Vessels may be denied the use of the locks if their lines are not in good condition, or if the mooring bits on barges are not accessible or are not equipped to prevent lines from slipping off when the water is lowered in the lock. All vessels entering the locks should have, in addition to the master, at least one person on deck to handle lines. Persons attempting to take vessels through the locks without assistance on deck may be required to wait until the lock is clear of other traffic before passing through. All operators of vessels are especially cautioned to use extreme care while crowded in the locks to avoid accident or fire on their boats. Operators of small vessels and larger vessels operating in the proximity of each other shall be alert to the danger arising from the limited maneuverability of the larger vessels, and shall exercise all precautions to prevent accident.

(6) Damage to locks or other structures. The regulations in this paragraph shall not affect the liability of the owners and operators of vessels for any damage caused by their operations to the locks or other structures. The sides and corners of all vessels and rafts passing through the locks should be free from spikes or projections of any kind which might damage the locks or other structures. Vessels with appurtenances or projections which might damage the locks or other structures shall be fitted with adequate fenders. The operators of vessels shall use care to avoid striking the guide walls or other structures pertaining to the canal.

(7) Commercial statistics. (i) On each passage through the locks, as required by section 11 of the River and Harbor Act of September 22, 1922 (42 Stat. 1043; 33 U.S.C. 555), the master or clerk of any vessel or other craft shall furnish, upon prescribed forms provided for the purpose and obtainable at the locks, a statement of the passengers, freight, and tonnage, and such other statistical information as may be required by the forms. The total cargo carried must be reported showing separately the tonnage in transit, and the tonnage, kind, and destination of cargo to be unloaded.

(ii) Reports of log rafts passing through the canal shall show the number of sections in the lock at each passage and, in the case of boom sticks, poles, or piles, the number of sticks in the tow. For logs, poles, or piles in cribs or in built-up rafts of more than one layer, the report shall show the total board feet in the raft.

(iii) Except by special permit, no vessel will be allowed to pass through the lock until a correct statement is furnished of the passengers, freight, and tonnage, and such other statistical information as may be required by the prescribed forms provided for the purpose.

(8) Rafts. (i) No log raft exceeding 700 feet in length or 76 feet in width shall pass through the canal. Boom sticks shall be smooth, with rounded ends, and securely tied together with cables, chains, or log swifters to prevent the raft from spreading while in the lock. Rafts containing logs that do not float above water for their entire length, or are in danger of being submerged when they enter fresh water, shall not be towed in the canal until such logs are securely fastened so as to prevent their escape from the raft.

(ii) Whenever required, log rafts passing in through the lock will be given a number that shall be fastened on one of the logs in the raft. This number will identify the raft and shall not be removed until the logs are used.

(iii) Two floats are maintained in Shilshole Bay near the entrance of the canal channel to facilitate the handling of logs in the canal. Rafts bound for the canal may be moored at one of these floats, only the portion of the raft that is to be taken through at a single lockage being brought into the canal. The remainder of the raft may be left at the float until the first portion has been towed to its destination above the lock.

(9) Tows. All vessels engaged in towing shall use tow lines of the least practicable length and shall have full control of their tows at all times. Towing more than one craft abreast is forbidden if the total width of the tow, including the towboat, exceeds 70 feet.

(10) Obstructing navigation. (i) All vessels and tows passing through the canal shall be kept as close as practicable to the center or, when safer, to the right side of the waterway, except when passing other craft or preparing to moor at a pier or wharf. Slowly moving log rafts, tows, or vessels shall, whenever practicable, pull out of the way when meeting other vessels or when other traffic proceeding in the same direction desires to pass. Vessels are forbidden to obstruct the canal in any way or to delay by slow passage through the canal the progress of other vessels. Small and readily maneuvarable vessels operating in the vicinity of larger, less maneuverable vessels shall, in all cases, keep clear, and operate with caution in order that the larger vessels may maintain safe steerage way and that hazards to all vessels may be reduced. All vessels shall operate with extreme caution and movements shall be made only when adequate precautions for the safety of other vessels and property are being effectively employed.

(ii) The placing of logs, vessels, or other floating objects within the limits of the dredged channels or anywhere in the canal where they may interfere with navigation to or from piers or industrial plants is prohibited.

(11) Turning. Vessels exceeding 100 feet in length shall not turn around, or attempt to turn around, in the portion of the canal between the Northern Pacific Railway Company bridge and a point 400 feet east of the Fremont Bridge, or in the Portage Cut.

(12) Excessive working of propellers or engines. Excessive working of the propellers of a vessel for purposes of testing or for other purposes when this creates objectionable or dangerous currents in the canal is forbidden. In case of grounding, the rapid or strong working of the vessel's engines is forbidden.

(13) Landing or mooring. No business, trading, or landing of passengers, freight, or baggage will be allowed on or over the canal piers or lock walls, or over the piers or grounds forming a part of the canal or its appurtenances. All persons in charge of or employed on any boat are prohibited from landing or mooring such boat at any of the canal piers, unless in transit through the canal or specially permitted to do so by the District Engineer or his authorized assistants.

(14) Deposit of refuse. The deposit, either from watercraft or from the shore, of any oil or refuse matter in the canal or upon the canal grounds is prohibited, nor shall water discharged from the side of a vessel be allowed to spill on the lock wall.

(15) Aids to navigation. Persons in charge of log rafts or other tows, and the masters of vessels and boats using the canal, shall keep a careful watch when passing buoys or other aids to navigation and promptly report to the District Engineer or his authorized assistants any displacement or damage to such aids.

NOTE: Aids to navigation and other related data are shown on United States Coast and Geodetic Survey Chart No. 6447.

(h) Lake Washington; seaplane restricted area, U.S. Naval Air Station, Sand Point, Seattle—(1) The area. (i) Beginning at a point bearing 346°07'15", 2,113.75 yards, from the tower at the northeast corner of Hangar No. 1, U.S. Naval Air Station, Seattle; thence 347°, 2,000 yards; thence 77°, 500 yards; thence 167°, 2,000 yards; and thence 257°, 500 yards, to the point of beginning.

(ii) The area will be marked by special pneumatic buoys as follows: Seven each on the easterly and westerly lines, equally spaced, forming two parallel rows 500 yards apart. Each corner buoy will be equipped with a yellow light and all other buoys with green lights. These lights will be lighted only during night flying operations. Each buoy will be marked in addition by black and yellow vertical stripes.

(2) The regulations. (i) This area shall be restricted to seaplanes for use in landing.

(ii) No vessel shall operate or anchor in the area except those attendant upon seaplane operations.

(iii) All other watercraft shall exercise due caution in navigating across the lake in the waters to the north and to the south of the restricted area, as there may be danger from planes about to land.

(iv) The regulations in this paragraph shall be enforced by the Commandant, Thirteenth Naval District, or his authorized representative.

(i) Elliott Bay, Smith Cove; naval restricted area—(1) The area. Beginning at the southwest corner of Great Northern Railway Pier 89, Smith Cove; thence 180°, 150 yards; thence 270°, 625 yards; thence due north to the shore of Smith Cove.

(2) The regulations. No vessel shall enter this area without permission of the Commandant, Thirteenth Naval District, or his authorized representative.

(j) Port Orchard; naval restricted area—(1) The area. Shoreward of a line beginning at a point on the west shortline of Port Orchard bearing 90° from stack (at latitude 47°42'01", longitude 122°36'54"); thence 90°, approximately 190 yards, to a point 350 yards from stack; thence 165°, 6,000 yards, to a point bearing 179°, 1,280 yards, from Battle Point Light; thence westerly to the shoreline at latitude 47°39'08" (approximate location of the Brownsville Pier).

(2) The regulations. (i) No vessel shall, at any time, anchor or tow a drag of any kind in this area.

(ii) The regulations in this paragraph shall be enforced by the Commandant, Thirteenth Naval District, or his authorized representative.

(k) Sinclair Inlet; naval restritced area—(1) The area. All the waters of Sinclair Inlet westerly of a line drawn from the Bremerton Ferry Landing (approximately latitude 47°33'49", longitude 122°37'19") to the Annapolis Ferry Landing (approximately latitude 47°32'59.5", longitude 122°36'52").

(2) The regulations. No vessel of more than 100 gross tons shall enter this area or navigate therein without

permission from the Commandant, Thirteenth Naval District, or his authorized representative.

(1) West Waterway, Seattle Harbor; navigation. (1) The movement of vessels of 250 gross tons or over and all vessels with tows of any kind through the narrow section of West Waterway between the bend at Fisher's Flour Mill dock and the bend at the junction of East Waterway with Duwamish Waterway, and through the draws of the City of Seattle and Northern Pacific Railway Company bridges crossing this narrow section, shall be governed by red and green traffic signal lights mounted on the north and south sides of the west tower of the City Light power crossing at West Spokane Street.

(2) Two green lights, one vertically above the other, displayed ahead of a vessel, shall indicate that the waterway is clear. Two red lights, one vertically above the other, displayed ahead of a vessel, shall indicate that the waterway is not clear.

(3) A vessel approaching the narrow section and drawbridges from either end of the waterway shall give one long blast of a whistle and shall not enter the narrow section until green lights are displayed.

(4) One vessel may follow another vessel in either direction, but the channel shall not be kept open in the same direction for an unreasonable time if a vessel is waiting at the other end.

(5) Tugs, launches, and small craft shall keep close to one side of the channel when vessels or boats with tows are passing.

(6) All craft shall proceed with caution. The display of a green light is not a guarantee that the channel is clear of traffic, and neither the United States nor the City of Seattle will be responsible for any damage to vessels or other property which may be chargeable to mistakes in the operation of the signal lights or to their failure to operate.

(m) Tacoma Harbor; naval restricted area—(Revoked).

(n) Carr Inlet, naval restricted area—(1) The area. The waters of Carr Inlet bounded on the southeast by a line running from Gibson Point on Fox Island to Hyde Point on McNeil Island, on the northwest by a line running from Green Point (at latitude 47°16′54″ N., longitude 122°41′33″ W.) to Penrose Point; plus that portion of Pitt Passage extending from Carr Inlet to Pitt Island, and that portion of Hale Passage extending from Carr Inlet southeasterly to a line drawn perpendicular to the channel 100 yards northwesterly of the Warren dock.

(2) The regulations. (i) The area shall be used as an acoustic range for research studies and special noise trials. No explosives shall be used.

(ii) No marine craft of any type shall at any time approach or remain within one hundred yards of the hydrophone buoys or the hydrophone cable connection house. The hydrophone buoys will be anchored in Carr Inlet on a line perpendicular to the course line opposite Ketner's Point, and about one mile from the Fox Island shore. The course line, or range, will bear 134°38′21″ (314°38′21″) true, and will be marked by range beacons erected near the shore line approximately one mile north-northeast of Steilacoom and approximately two miles north-northeast of Home. The cable connection house will be framed on piling in Carr Inlet approximately 20 yards off the Fox Island shore, opposite Ketner's Point.

(iii) The remainder of the area shall be open to navigation at all times except when the range is in use or when hydrophones are being calibrated. When the range is in use or hydrophones are being calibrated, revolving beacon lights will be displayed on the following signal towers:

Signal tower No.	Location	Visible sector (bearings true)
1	Gibson Point	039° to 285°.
2	Fox Island, 2,500 yards northwest of Ketner's Point.	295° to 111°.
3	Green Point	135° to 339°.
4	Penrose Point	319° to 120°.
5	Pitt Island	000° to 050°. 199° to 225°.
6	Hyde Point	059° to 235°.

The beacon lights on Towers Nos. 1, 4, 5, and 6 will be red, and on Towers Nos. 2 and 3 will be either red or green. The beacon lights will show 1 quick flash every 10 seconds. The lights will be obscured except for the above tabulated visible sectors. The ranging of vessels or calibration of hydrophones requiring restrictions will be conducted at intervals during two 3-hour periods, that is, between the hours of 9 a.m. to 12 noon and 1 p.m. to 4 p.m., Monday through Friday, except for national holidays consisting of New Year's Day, Washington's Birthday, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, and Christmas Day, and will total approximately 150 days spread throughout the year. Shutting off of beacon lights will indicate termination of use of the range for the remainder of that period. Insofar as possible, the schedule of operations giving the days the range will be in use for each forthcoming month will be published in local newspapers and in the local U.S. Coast Guard Notice to Mariners.

(iv) When the red beacon lights are displayed indicating that the range is in use or hydrophones are being calibrated, navigation within the area will be restricted as follows:

(a) As used in this section, the words "operate, power vessel and non-power vessel" are defined as follows:

(1) "Operate": To be physically present in the designated area.

(2) "Power vessel": A vessel propelled principally by a mechanical propulsion system (i.e., gasoline, Diesel, steam or electric drive to a propeller, pump jet, paddle wheel or other device), and being propelled by that means.

(3) "Non-power vessel": A vessel not equipped with a mechanical propulsion system, such as a rowboat, canoe or sailboat propelled by oars, paddles, or sails, respectively.

(b) Power vessels shall not operate within the area, except that traffic in either direction between Hale Passage and upper Carr Inlet, within 200 yards of the low water mark off Green Point, will be cleared by signal for

approximately 15 minutes total time within this area at the termination of individual ranging runs, while the vessel being ranged takes position for the next run. Clearance to traverse the area around Green Point will be indicated by extinguishing the red beacon lights and displaying the green beacon lights on Signal Tower No. 2 on Fox Island and Signal Tower No. 3 on Green Point.

(c) Non-powered marine craft shall not operate within one mile of the course line bearing 134°38′21″ (314°38′21″) true, and within two miles to the southeast and two miles to the northwest of the hydrophone buoys situated in Carr Inlet opposite Ketner's Point: Provided, however, Non-powered craft may operate within four hundred yards of the low water mark on the northeast side of McNeil Island, within two hundred yards of the low water mark at Green Point, and within two hundred yards of the low water mark on the southwest shore of Fox Island except for maintaining the required one-hundred yard clearance around the cable connection house. (See subdivision (ii) of this subparagraph.)

(d) Towboats shall have free access and egress to designated tow havens within Carr Inlet, as follows: The Navy will establish and maintain suitable mooring buoys for the use of tugs and their tows at the following points: (1) Approximately 1,500 yards northwest of Gibson Point Light and approximately 400 yards offshore from the low water mark on the Fox Island shore; (2) approximately 1,500 yards northwest of Hyde Point and approximately 400 yards offshore from the low water mark on McNeil Island shore; (3) and at a point midway between the north point of Gertrude Island and the northwest point of Still Harbor. Towboats will signal by radio, telephone or visual flag hoist as far in advance as possible of the time they enter the tow haven, such signals to be directed to the range instrument vessel to be located on the Fox Island side of Carr Inlet. The Navy shall promptly suspend operations when necessary to permit the access and egress of such tow traffic, and shall signal the tows when the area is clear.

(e) Through commercial traffic, including tows, to points within Carr Inlet, and through Carr Inlet, Pitt Passage and Hale Passage to adjacent waters will be permitted free access and egress, as follows: Such traffic will signal by radio, telephone or visual flag hoist as far in advance as possible of the time they enter the area, such signals to be directed to the range instrument vessel to be located on the Fox Island side of Carr Inlet. The Navy shall promptly suspend operations when necessary to permit the passage of such traffic, and the instrument vessel shall signal when the area is clear for passage.

(f) The warden of the McNeil Island penitentiary and his authorized representatives shall be permitted to operate within the area at any time, as may be necessary, for the patrol and search for escaped convicts.

(g) Red or green signal flags will be displayed on the signal towers in case of failure of the red or green beacon lights. The display of the signal flags at the top of the flag masts will have the same significance as the beacon lights.

(3) The regulations in this paragraph shall be enforced by the Commandant, Thirteenth Naval District, and such agencies as he may designate.

(o) Dabob Bay, Whitney Point, Naval Restricted Area—(1) The area. Beginning at the high water line along the westerly shore of Dabob Bay, 100 yards northerly of the Naval control building located at approximately N. latitude 47°45′36″ and W. longitude 122°51′00″, thence S. 89°59′ E. 2,000 yards, thence to S. 00°01′ W. 200 yards, thence N. 89°59′ W. approximately 2,000 yards to the high water line 100 yards southerly of the control building.

(2) The regulations. (i) No vessel shall, at any time, anchor or tow a drag of any kind in this area.

(ii) The regulations in this paragraph shall be enforced by the Commandant, Thirteenth Naval District, or his authorized representative.

§ 207.770 Snoqualmie and Snohomish Rivers, Wash.; logging. Loose logs may be floated in navigable parts of of the Snoqualmie and Snohomish Rivers under the following conditions:

(a) All loggers and river drivers operating on the Snoqualmie and Snohomish Rivers shall be required to register at the United States Engineer Office, Seatle, Wash., giving the firm name, manager's name, and postoffice address.

(b) No logs shall be dumped into the rivers or released from storage booms without being turned over to a registered driving company, firm, or individual.

(c) River drivers authorized to operate on these streams must maintain a sufficient organization of boats and experienced workmen to care for the drives of their customers.

(d) River drivers shall so conduct their operations that all parts of the river will be effectively patrolled and the formation of jams prevented.

(e) During times of freshet, river drivers shall increase their force and station men at critical points where jams are liable to form.

(f) Loggers who entrust their logs to river drivers will be required to satisfy themselves that their logs are being driven in accordance with this section, and if continued unconcern on their part results in confusion, the privilege of dumping logs into the stream shall be denied to them.

(g) Hemlock logs that will not float for their entire length shall not be deposited in the rivers.

§ 207.780 Sammamish River, Wash.; logging. Logs may be floated on Sammamish River between Lakes Sammamish and Washington under the following conditions:

(a) At least once every 6 months all loggers, log owners, and river drivers operating on the Sammamish River shall be required to register at the United States Engineer Office, Seattle, Wash., giving full name and post office address.

(b) Logs run from Lake Sammamish shall be in charge of a competent driving crew and kept continuously on the move while in transit.

(c) Loggers putting logs into Sammamish River shall inclose their logs in pocket booms along the bank of the river, and these pocket booms shall be so arranged that a free passagaway of ruling depth, at least 12 feet wide, shall be left between the boom and opposite shore.

(d) When logs are released from pocket booms they shall be placed in charge of a competent driving crew and kept continuously on the move to Lake Washington or to the mills located on Sammamish River.

(e) Should a blockade of logs occur in the river at any time, each logger whose brand appears on any of the logs in said blockade shall discontinue dumping logs into the river until the blockade has been broken.

(f) Log drivers who indifferently operate, or who delay the transit of logs, will be denied the privilege of operating in such capacity on this stream.

(g) To make unnecessary the present practice of storing logs in the Sammamish River, no logs will be started down this stream until provision has been made for boom sticks at the mouth sufficient to hold the entire drive or other means of storage provided.

§ 207.805 Pacific Ocean southwest of Laau Point, Molokai, Hawaii; Navy drill minefield. (a) The restricted area. A square area in the Pacific Ocean southwest of Laau Point, Molokai, having sides 1,000 yards long running due north-south and east-west, with its northeast corner at latitude 21°03′09″, longitude 157°-20′20″, bearing approximately 210° true, 3.5 miles, from Laau Point Light. Nonexplosive mines will be placed in the area at alternate depths of 30 feet and 90 feet.

(b) The regulations. All vessels with draft in excess of 20 feet, except those duly authorized by the Commander, Hawaiian Sea Frontier, United States Navy, are prohibited from navigating or anchoring in the restricted area.

§ 207.900 Restricted areas in vicinity of Maritime Administration Reserve Fleets. (a) The regulations in this section shall govern the use and navigation of waters in the vicinity of the following National Defense Reserve Fleets of the Maritime Administration, Department of Commerce:

(1) Hudson River Reserve Fleet, Jones Point, New York.

(2) James River Reserve Fleet, Fort Eustis, Virginia.

(3) Wilmington Reserve Fleet, Brunswick River near Wilmington, North Carolina.

(4) Mobile Reserve Fleet, Tensaw River near Bay Minette, Alabama.

(5) Beaumont Reserve Fleet, Neches River near Beaumont, Texas.

(6) Suisun Bay Reserve Fleet near Benicia, California.

(7) Astoria Reserve Fleet, Cathlamet Bay near John Day Point, Oregon.

(8) Olympia Reserve Fleet, Budd Inlet at Olympia, Washington.

(b) No vessels or other watercraft, except those owned or controlled by the United States Government, shall cruise or anchor between Reserve Fleet units, within 500 feet of the end vessels in each Reserve Fleet unit, or within 500 feet of the extreme units of the fleets, unless specific permission to do so has first been granted in each case by the enforcing agency.

(c) The regulations in this section shall be enforced by the respective Fleet Superintendents and such agencies as they may designate.

3. CALIFORNIA, OREGON, AND WASHINGTON

The California-Oregon-Washington coast of the United States, between Mexico on the south and Canada's British Columbia on the north, is mostly rugged and mountainous, with high land rising abruptly from the sea in many places. South of San Francisco Bay the mountains are usually bare or covered with chaparral and underbrush. North of the bay the mountains are generally well timbered, and in some places, especially northward of the Columbia River, the timber is particularly dense and heavy.

Aids to navigation.—Lights are numerous along the coast; there are only a few places where a vessel is not in sight of one or more lights. Lightships are stationed off San Francisco Bay, Blunts Reef, Columbia River, and Umatilla Reef. Radiobeacons and fog signals are at the lightships and most of the principal light stations. Loran coverage is good. The critical dangers are buoyed and are generally marked by kelp.

There are many aero lights along the coast that are useful for navigation purposes, but they should not be confused with the marine lights.

Boundary lines of inland waters.—At all buoyed entrances from seaward to bays, sounds, rivers, or other estuaries for which specific lines are not described, **Inland Pilot Rules** apply shoreward of the outermost buoy or other aid to navigation of any system of aids; **International Pilot Rules** apply outside the aids. Specific lines are described in **Part 82, Chapter 2.**

Control over movement of vessels.—See **Part 124,** Chapter 2, for regulations requiring advance notice of vessel's time of arrival to Captain of the Port.

Depths in the approaches to this coast are too great to determine readily without an echo sounder. The slope downward from the 100-fathom curve is very abrupt, as is also the slope in many places between the 30- and 100-fathom curves. The 100-fathom curve lies at an average distance of less than 10 miles from shore, but this distance is exceeded in the approaches to San Francisco Bay, Heceta Bank, Columbia River, and the Strait of Juan de Fuca.

Anchorage, affording shelter from the severe northwesterly winds of summer, may be had in a number of places along the coast. In southeast and southwest weather there are few places where shelter is available; San Diego Bay, Los Angeles Harbor, the lee side of the Channel Islands, and Monterey Bay are the only places south of San Francisco Bay. North of San Francisco, good shelter is found in Humboldt Bay, Coos Bay, Tillamook Bay, Columbia River, Willapa Bay, and Grays Harbor; but most of these places must be made before the sea rises, as afterward the bars become impassable. Neah Bay, just inside the entrance to the Strait of Juan de Fuca, is used considerably by vessels in westerly or southerly weather.

Dangers.—There are few outlying dangers, the principal ones being Bishop Rock, westward of San Diego; Noonday Rock and the Farallon Islands, off San Francisco Bay; and Blunts, St. George, Rogue River, Orford, and Umatilla Reefs, northward of San Francisco. The Channel Islands, off southern California, are the largest, most prominent, and the farthest offshore of any along the coast.

Kelp grows on nearly every danger with a rocky bottom and is particularly heavy at various points in Santa Barbara Channel and in the vicinity of San Diego Bay. It will be seen on the surface of the water during the summer and autumn months; during the winter and spring it is not always to be seen, especially where it is exposed to a heavy sea. Many rocks are not marked by kelp, because a heavy sea will occasionally tear it away and a moderate current will draw it under water so that it will not be seen. When passing on the side of a kelp patch from which the stems stream away with the current, care should be taken to give it a good berth. Dead, detached kelp floats on the water curled in masses, while live kelp, attached to rocks streams away level with the surface. Live kelp is usually an indication of depths less than 10 fathoms.

Tides.—A very important characteristic of the tides along the western coast of the United States is the large inequality in the heights of the two high waters and of the two low waters of each day. On the outer coast the average difference between the heights of the two high waters of the day is from 1 to 2 feet, and the aver-

age difference in the heights of the two low waters from 2 to 3 feet. It was because of this large difference in the low-water heights that the mean of the lower low waters, rather than the mean of all low waters, was adopted as the plane of reference for the charts of this region.

This inequality changes with the declination of the moon. When the moon is near the Equator the inequality is relatively small; but when the moon is near its greatest north or south declination, the difference in the heights of the two high waters or of the two low waters of each day reaches a maximum. The tides at this time are called **tropic tides.**

Off the outer coast the mean rise of the tide above the plane of reference varies from 5 feet off southern California to about 7.5 feet off the coast of Washington. Extreme variations from 3 feet below to 10 feet above the datum may reasonably be expected.

At the entrance to San Francisco Bay the mean rise of the tide is about 5 feet above the plane of reference. At the southern end of the bay the tide occurs about 1½ hours later, and the mean rise is about 2.5 feet greater that at the entrance to the bay. Passing northward into San Pablo Bay, the tide occurs from 1 to 2 hours later than at the Golden Gate, with a mean rise of about 0.5 foot greater than at the latter place. In Suisun Bay the time of tide is about 3 hours later than at the Golden Gate, with a mean rise about the same. It requires about 4 hours for high water to pass from Suisun Bay to Stockton, on the San Joaquin River, and about 5 hours from Suisun Bay to Sacramento, on the Sacramento River. The mean rise of the tide above the plane of reference at Stockton is 3.6 feet, and at Sacramento is 2.6 feet.

In Humboldt Bay the tide is from ½ to 1 hour later than on the outer coast. The mean rise is about 6 feet above the plane of reference.

In Coos Bay the tide is from ½ to 1½ hours later, and the rise of high water about the same as in Humboldt Bay.

In Yaquina Bay the mean rise is about 7 feet above the plane of reference.

At the entrance to Columbia River the mean rise is about 7 feet above the plane of reference. It requires about 6 hours for high water to pass from the entrance to the Columbia River to the mouth of the Willamette River. In passing up the Columbia River the range of tide decreases until it is only 1.4 feet at the mouth of the Willamette. Above this point the tidal range becomes too small to be of practical importance. There are, however, large fluctuations in the level due to meteorological conditions. An extreme variation of 24.5 feet has been noted at St. Johns on the Willamette River. Columbia River is usually highest during May, June, and July, and lowest during September, October, and November.

In Willapa Bay and in Grays Harbor the mean rise is about 9 feet above the plane of reference.

Passing through the Strait of Juan de Fuca, the tide occurs about 3 hours and 40 minutes later at Port Townsend than at Cape Flattery. The mean rise increases from 7.2 feet above the datum at Cape Flattery to 7.9 feet at Port Townsend. There is an increase in the average inequality between the two low waters of each day from 3 feet at Cape Flattery to 5 feet at Port Townsend. The average inequality between the two high waters of each day at both places is about 1.5 feet.

In Puget Sound the tide is about ½ to 1 hour later than at Port Townsend. The mean rise increases from 7.5 feet above the datum of mean lower low water at Port Townsend to 13.5 feet at Olympia. In Puget Sound the average difference between the two low waters of each day is 6 feet. At Seattle an extreme range from 4.5 feet below the datum of mean lower low water to 15 feet above the same datum has been observed. At Olympia, in the southern part of the sound, an extreme high water 18 feet above the datum has been noted.

In San Juan Archipelago the mean rise of the tide varies from 6.5 to 8 feet above the plane of reference. An extreme range from 4.5 feet below the plane of reference to 12 feet above the same datum may reasonably be expected.

Caution.—In using the Tide Tables, high or low water should not be confused with slack water. For ocean stations there is usually little difference between the time of high or low water and the beginning of ebb or flood currents; but for places in narrow channels, landlocked harbors, or on tidal rivers the time of slack water may differ by several hours from the time of high or low water stand. The relation of the times of high and low water to the turning of the current depends upon a number of factors, hence no simple rule can be given. For predicted times of slack water or strength of current, see the Tidal Current Tables.

Currents.—A current, the outer limit of which extends offshore more than 300 miles, flows approximately parallel to the Pacific coast of the United States from 50° to 30° north latitude. The direction of the current is generally southward throughout the year except as noted below. Its velocity, which averages about 0.2 knot, is greatly influenced by prevailing winds, northerly winds increasing it and southerly winds diminishing it.

North of latitude 45° the set is usually northward from November through February.

Along the coast during certain periods there is a weak northerly flow known as the **Davidson Inshore Current,** which is evident between San Diego and Point Conception from July through February and between Point Conception and Cape Flattery from November through February.

Along the coast of Vancouver Island there is usually a northwestward flow, which as measured at Swiftsure Bank (48°32.0′ N., 124°59.7′ W.) has a velocity of nearly 0.5 knot at all seasons.

The above statements apply to general or average conditions. The currents, particularly offshore, at a specific time depend largely upon prevailing winds, whereas alongshore and off the entrances to inland waterways they depend also upon tidal and drainage effects.

For detailed information, consult the Tidal Current Tables.

Seismic sea waves.—Although the coasts of California, Oregon, and Washington are not generally subject to waves of the magnitude which strike the Hawaiian Islands and other Pacific areas, widespread damage to ship-

ping and to waterfront areas occasionally occurs. The wave of May 23, 1960, originating off the Chilean Coast, caused several hundred thousand dollars damage to ships and docking facilities in the Los Angeles area alone. The loss of life and property can be lessened if shipmasters and others acquaint themselves with the behavior of these waves so that intelligent action can be taken when they become imminent. See Chapter 1 for details about these waves.

The Warning System operated by the Coast and Geodetic Survey and described in Chapter 14 supplies warnings to the Civil Defense authorities in California, Oregon, and Washington who are responsible for disseminating this information to the affected areas.

When a warning is received, persons should vacate waterfront areas and seek high ground. The safest procedure for ships will depend on the amount of time available and this may not always be known. A ship well out at sea would ride such waves safely, and hence if time is available to put to sea, that would be the safest action. On the other hand, the crew of a ship in harbor may have a difficult time averting serious damage. The ship may be washed ashore by incoming waves or grounded because of excessive withdrawal of water between crests. Much of the damage in the Los Angeles area during the 1960 waves was caused by rapid currents and the swift rise and fall of the water level breaking mooring lines and setting floating docks and ships adrift.

WEATHER.—The Appendix includes climatological tables for Pacific coast ports and a table of fog-signal operation. Also listed are Weather Bureau offices, storm warning displays, and radio stations which transmit weather information.

General.—The Pacific coastal region of the United States and the adjacent ocean areas are located along the eastern portion of the Pacific high pressure system. This HIGH, when well developed, forms the principal circulation control forcing most of the LOWS that develop to follow a course northward of the United States. This action damps out weather changes that might otherwise occur and brings to the weather along the coast a stability factor that would not otherwise exist. Air which reaches the coast as a result of the prevailing westerly winds has acquired much water vapor during its passage over the ocean with resultant high humidities over the coastal regions. The marine influence is also evidenced in a cooling effect in summer and warming influence in winter.

Pressure and annual changes in the weather pattern.—During the summer the North Pacific HIGH reaches its greatest development. In July the center, with highest pressure about 1,025 millibars, is located in the latitude of San Francisco near 150° W. Average pressure in excess of 1,015 millibars prevails over most of the ocean area north of 20° N. almost to Alaska and west from the Pacific coast to about 160° E. At this season of the year the Aleutian LOW is almost nonexistent.

By October the HIGH has contracted, particularly on the north in the direction of the Aleutian LOW which has formed over Alaska and the Bering Sea with pressures of 1,002.5 millibars and below prevailing over southwestern Alaska including the Aleutian Islands. This low-pressure area which appears as a permanent system on the charts is actually the result of frequent migratory lows that move through the area during the winter season.

In October, the Pacific HIGH extends from the U.S. coast across the Pacific Ocean and into the Asiatic Continent and reaches a maximum of 1,020 millibars in the vicinity of 30°-35° N. and 135°-140° W. Weakening of the HIGH continues with the approach of the winter season and by November it is little more than a weak belt of high pressure lying between the Aleutian LOW and the equatorial belt of low pressure. Lows continue to form along the polar front and tend to make their path through the area covered by the Aleutian LOW. In winter these traveling depressions moving eastward cause considerable day-to-day variation in pressure, particularly in the area north of 40° N.

During the spring months there is a gradual return to the summer pattern with the HIGH spreading northward and the LOW becoming further contracted. Migratory LOWS become less frequent and enter the continent farther north. Day-to-day fluctuations in pressure are much smaller than in the winter months.

Winds.—Over the northern portion of the Pacific HIGH north of 40° N., and including the Oregon and Washington coasts, the prevailing direction of the wind is westerly. There is a tendency for the winds to shift to the north of west during the summer when pressure over the United States is lower than that over the Pacific Ocean, and to the south of west during the winter when pressure over the continent is higher than it is over the ocean. These prevailing westerly winds north of the HIGH extend westward across the entire North Pacific and reach northward throughout the area of this summary and on toward the Arctic Circle.

Along the California coast south of 40° N. the prevailing wind during the greater part of the year is from the northwest, a direction that brings it nearly parallel to the coast. The average velocity of these winds off the ocean is generally low during the greater part of the year. There are, however, occasions when warm dry descending winds from the northeast and east come roaring through the major passes of the coastal mountains. These winds, often accompanied by desiccating temperatures, may exceed 45 knots and at times carry considerable dust.

Gales.—There is considerable difference in frequency of gales between the northern and southern portions of this coast. Gales are most frequent in the winter, averaging 5 to 8 percent of observations along the Washington coast and only about 1 percent along the southern California coast. In summer, the coastal area of Washington averages less than one percent of observations with gales while the coast of Oregon southward to central Califor-

nia averages 1 to 2 percent. Gales are very infrequent along the southern California coast in summer.

The direction from which gales blow shows a marked seasonal variation. In winter they may occur from any direction but more blow from the southeast, south, or southwest than all other directions combined. Few or none come from the northeast or east. In summer gales are almost exclusively from the northwest and north.

Along the coast of Washington (45° to 50° N.) the season of maximum gales extends from early October until April. This is the period when differing air masses and fronts address the coast. The fact that most gales during this period are from the southeast, south, or southwest indicates that they occur in the warm sector of the LOW. During June, July, and August, gales from any direction are rare. From northern Oregon to northern California (40° to 45° N.) the season of maximum gales along the coast lasts from November through February. During these months most of the gales blow from the southeast and south with a few from the north and northwest. March and October are transition months. From April through September gales are fewer and those that do occur are usually from the northwest or north.

Farther south along the California coast (35° to 40° N.), northwest gales are more frequent and occur at all seasons although they are most frequent from March through July. Northwest gales are as frequent or more frequent than gales from any other direction in all months. There is a secondary maximum of southeast and south gales from November through March.

The coastal waters of southern California (south of 35° N.) have gales so infrequently that they are recorded in only one percent of the observations in January and December. No direction stands out as predominant.

Local winds.—The mountains along the coast form such an effective barrier to the free exchange of air between the ocean and the interior that when there is a considerable pressure gradient between the continent and the ocean, strong winds develop in the passes and valleys. Notable among these surface winds that are caused by topography and that affect navigation are the winds in the Strait of Juan de Fuca and the Santa Ana near Los Angeles.

Winds in the Strait of Juan de Fuca as measured at Tatoosh Island are so modified by topography that it is not always obvious what pressure gradients will produce strong east winds at Tatoosh Island. The frequency of easterly winds increases with the coming of winter until, in January, about half the time the wind is due east and the average speed about 20 knots. The minimum frequency is in July and August when winds are east only 8 to 10 percent of the time, and the average speed has dropped to about 10 knots.

Under the influence of an anticyclone, the easterly winds may blow out of the Strait of Juan de Fuca at high speeds for several days at a time, with unclouded skies and otherwise pleasant weather. Much of the force of the easterly wind is apparently local and due to the configuration of the strait. The shoreline on the south side for 5 miles eastward extends almost due east and west.

An important difference between the easterly winds and westerly winds is their respective effect on the waves. The swell is normally propagated from west to east, or onshore. Any westerly wind tends to heighten the waves. An easterly wind, on the contrary, beats the sea down until a speed of about 47 knots is attained, after which the wind produces an offshore wave of comparatively slight intensity.

The **Santa Ana** is an offshore desert wind usually occurring in or near San Pedro Bay. While infrequent, it may be violent. These winds are most apt to occur in late autumn or winter and at times may reach a speed of 52 knots.

Meteorological conditions are favorable for a desert wind whenever a strong area of high barometric pressure moves in or develops over the Plateau region, and the barometric gradient calls for northeast or east winds over southern California. The air moving outward from this high-pressure area streams through Cajon Pass into the Great Valley of southern California. If the pressure difference between Nevada and southern California is only moderate, the desert winds are usually confined to rather narrow belts extending from the mouths of the passes to the ocean by the lowest and least obstructed routes.

These airstreams from Cajon Pass usually maintain their identity in a remarkable manner. They move out over the valley floor, swing toward the southwest, and either follow the Santa Ana River Canyon through the Santa Ana Mountains, or move directly over the low mountains south of the canyon and then follow a well-defined path over the almost level plains of Orange County and reach the ocean in the vicinity of Newport. The stream may shift its position slightly from time to time, but appears to change only little in width or velocity as it follows a well-defined path to the ocean. It often comes over the south foothills at the western entrance to Santa Ana Canyon, appearing to come down the hillsides in strong gusts directly along the ground.

These winds diminish little, if any, immediately after passing over water, and some reports credit them with blowing considerable distances at sea. However, beyond 50 miles from shore they are usually of no particular concern.

Aside from weather forecasts broadcast by radio, the mariner has only short notice of the approach of a Santa Ana. The barometer is almost useless when its readings are taken alone, for there is little pressure variation, although a gale may spring up and blow for hours. For some hours before a Santa Ana, there is usually a period of good visibility and unusually low humidity. Shortly before its arrival on the coast, the Santa Ana may be observed as an approaching dark-brown dust cloud. This will often give from 10 to 30 minutes warning, and is always one of the positive indications.

The Santa Ana may come any time during the 24 hours, but its strength is reinforced or opposed by the ordinary

land and sea breezes. The reinforcement by the land breeze tends to produce the greatest velocity between 7 a.m. and 9 a.m., and its force can be expected to lessen after 10 a.m.

Tropical storms.—The southern portion of the Pacific coast may be affected by tropical storms which originate in or near the Gulf of Tehuantepec in late summer and autumn. An average of about eight such storms occurs each year although few come far enough north to affect U.S. coastal waters. Most have lost hurricane intensity by the time they reach these waters and are short lived. These storms may bring unseasonable rains and squally weather to extreme southern California, but they seldom affect the area farther north. The coasts of Baja California, Sonora, and Sinaloa in Mexico suffer the greatest damage from these tropical storms.

Fog.—Both summer- and winter-type fogs are common along the Pacific coast, with the summer type being more frequent and extensive. The generally light anticyclonic winds which prevail during the warm months, when the North Pacific HIGH remains stable, are conducive to both the formation and maintenance of fog.

During most of the year the temperature of the water off the coast is lower than that of the ocean farther to the west, the greatest differences occurring in July, August, and September. The cooling effect of these coastal waters upon the easterly moving air above it is a primary factor in the prevalence of summer fogs. Under these conditions the warm, moist air from the westward easily attains its dewpoint and the resulting fog drifts toward the coast and moves inland.

In winter fog is much less prevalent than during the summer. It is more local in character and, although it may extend over a considerable range in latitude, it seldom extends any great distance to sea. However, when the so-called summer or advection type of fog, which may also occur in winter, unites with fog which has formed over the land, a sheet of fog may extend a considerable distance to sea.

The seaward extent of fog varies greatly. The band of densest and most frequent fog occurs over the narrow stream of colder water just off the coast and is frequently limited to a band of 50 miles or less. At other times fog covers large areas both in latitude and in longitude, and may extend for hundreds of miles to sea.

The months of maximum occurrence of fog off the Pacific coast vary somewhat with the different localities and, of course, with the individual year. Fog is most prevalent over Puget Sound in the late summer and fall months. Over the Strait of Juan de Fuca, sea fog predominates and its greatest frequency is in August and September. Fog occurs with almost equal frequency over the strait throughout the other months. Along the coast proper, from Tatoosh Island to the lower California coast, the period of most frequent fog is from July to October, and that of least frequent from December to May. On the lower coast of California, that is, from Los Angeles southward, the foggiest months are those from September to February, and the least foggy, from May to August. In the San Francisco Bay region the incidence of low visibility (less than 2 miles) rises sharply in the fall months, rather than in the summer, because of the occurrence of radiation fog.

Over the Puget Sound area radiation fog predominates. During the late summer and fall there are a great many nights with clear skies and very little movement of the air. During the night, as heat is lost from the earth by radiation, the air cools to its dewpoint temperature, and fog results. In the late summer, the nights are shorter and the opportunity for radiation cooling is not quite so great; consequently, the fog is not so thick and dissipates rather early in the morning. As the nights lengthen during autum, the fog will form earlier and to a greater depth and will not dissipate so early in the morning; in fact, under very stagnant conditions in October it is not uncommon for fog to hang over this region for several days. Not until a storm approaches the coast which will cause sufficient wind to blow out the fog, is this region free from it.

There is not so much fog in November and December because the increase in cloudiness prevents the radiation cooling necessary to form fog, and there is too much wind. The less common type of fog in this area, advection fog, usually accompanies frontal systems or is a result of the movement of the warm moisture-laden air from the southern latitudes of the ocean over the colder water and land to the north.

Offshore near the Strait of Juan de Fuca, thick fog banks sometimes rear themselves almost perpendicularly, facing clear weather inshore, thus allowing a vessel to arrive at destination without difficulty. At other times, the bank will move slowly into the strait, enveloping both shores for some distance, then perhaps leaving the Vancouver shore to the northward and clinging to the Washington shore. Port Angeles, about halfway between the the Pacific coast and the junction of the strait with Puget Sound, has water on three sides, and is subjected to both sea and radiation fog. Sea fog predominates, its maximum frequency being 8 days in August.

Off the coasts of Washington and Oregon, navigation is sometimes seriously obstructed by dense smoke from forest fires, which are most prevalent from July to September. At other times light smoke will add to the density of fog.

The maximum frequency of fog along the coast of Washington and Oregon is 16 percent at Tatoosh Island, occurring in August. Between Tatoosh Island and Brookings, Oreg., where 14.5 percent of observations in July record fog, smaller frequencies are encountered. From Brookings to north of the Golden Gate the maximum percentage frequency is reached near Blunts Reef. In the vicinity of Eureka, where there are coastal plains, maximum frequency of fog is in the fall, and is of the radiation type. Humboldt Bay, the harbor of Eureka, however, is an area of dense sea fog, and the shoals near there are dangerous to vessels in thick weather. Between Blunts Reef and San Francisco are two of the most foggy spots on the Pacific coast: Point Arena and Point Reyes. Point Reyes is often spoken of as being the actual center of heaviest and most frequent fogs on the Pacific coast; this is true

when an average over a long period of record is considered. Owing to the persistency of the fog cover, through which it is said the sun's rays sometimes fail to penetrate for 3 or even 4 weeks at a time, Point Reyes has close to the lowest midsummer temperature of any observing station in the United States.

Golden Gate, the entrance to San Francisco Bay, is a region of frequent fog, and shipwrecks have been numerous there. Often a sheet of fog forms in early forenoon off the bold headlands on either side of the Golden Gate and becomes more formidable in size as the day wears on. As the temperature rises in the warm inland valleys, a steadily increasing indraft takes place. Then the fog, perhaps 1,500 or more feet in height, approaches the shore and enshrouds a good portion of all of San Francisco Bay. Under favorable temperature conditions, the fog will overspread the shore and rise up the more than half-mile height of Mount Tamalpais.

There are several well-marked types of fog in the vicinity of San Francisco. First and most prominent is the summer afternoon sea fog described above which moves inland at an average rate of 14 knots. The second type, a low-lying dense land or river fog, forms during winter mornings and drains slowly seaward at the rate of perhaps a knot. It is essentially a valley fog and is most marked in the lowlands, but sometimes on clear winter nights, when the cooling due to radiation is high, fog forms early over the city and bay, dissipating before noon. As a rule, the city hills and even the roofs of the tall office buildings are above the fog. The high parts of the city are generally out of the fog several hours before the low portions. The third type is a nondescript fog, formed by a mixture of city smoke and dust with the condensed vapor.

In summer the afternoon sea fog varies in depth from 100 to about 1,500 feet, the depth decreasing as the distance inland increases. On summer afternoons the velocity of the wind at San Francisco with almost clocklike regularity rises to over 19 knots, and a solid wall of fog comes through the Golden Gate, causing a fall in temperature.

Between San Francisco and Monterey, warm-water eddies are interposed between the cold waters and the coast, and a band of less frequent fog results. Estero Bay, just a few miles south of Point Piedras Blancas, is also one of the foggiest spots along the coast.

Surface fogs are not a common phenomenon over the waters of southern California below Point Arguello, since warm-water eddies lie between the coast and the cool California current. This condition results in a preponderance of low stratus clouds rather than surface fog. The minimum occurrence is at San Diego Bay. Point Arguello is the southernmost point in the band of maximum occurrence of fog. There the cool water lies close inshore and the maximum frequency of 10 percent occurs in July and August. Fogs at Point Arguello are invariably thick, and this point is recognized by mariners as one of the most dangerous on the coast. While the coast of southern California has a minimum frequency of fog, there are two very foggy spots off the coast of Los Angeles. These are San Miguel Island and Buffalo Springs on Catalina Island.

Along a great length of the coast, fog may be found at any time of the day. At North Head, Washington, fog is often formed when northwest winds of forces 2 to 4 occur; at Tatoosh Island it often comes in with south or southwest winds. When northwest winds approach Humboldt Bay and warm air currents come from the land, the two frequently mingle, resulting in fog banks along this dangerous part of the coast. Off southern California, night and early morning fogs predominate.

Precipitation.—Along the Pacific coast of the United States most of the precipitation falls during the winter with the summer being generally dry. While this pattern prevails along the entire coast the amount of rainfall and the length of the season increases gradually from south to north. This trend is clearly indicated in the climatological tables in the Appendix. It shows that the summer rainfall at Tatoosh Island almost equals the winter rainfall at San Diego. At coastal stations, topography and proximity to the ocean exert some slight influence in the average rainfall.

Thunderstorms are infrequent along the coast and over the adjacent ocean areas. With the exception of the extreme southern portion of the California coast, thunderstorms occur almost entirely during the winter portion of the year. Along the Washington and Oregon coasts the average is about 7 to 9 thunderstorms a year, while at San Francisco the average drops to 2 per year.

Temperature.—The prevailing westerly winds carrying the modifying effect of the ocean into the coast bring moderate and equable temperatures to the coastal portions of California, Oregon, and Washington which are accompanied by few extremes of heat or cold. The range between the normal winter temperature and that of summer averages about 15° F. to 25° F. at coastal stations and lies between a low range of 10° F. at Eureka, Calif., and a high range of 30° F. at Portland, Oreg. Along the northern coastal areas, cold periods develop slowly and warm spells are usually short lived.

The coldest temperature recorded at the coastal stations listed in the Appendix is 14° F. at Tatoosh Island, Wash., in January. At such low-level locations with marine exposures temperatures seldom drop below freezing. At Tatoosh Island the average is only 8 days a year. At northern locations farther from the coast minimum temperatures below freezing may occur on as many as 50 days a year. At coastal stations from San Francisco southward freezing temperatures are almost unknown.

Although the highest temperatures of record have exceeded 100° F., at most west coast locations there are actually few days in which the high temperatures exceed 90° F. Los Angeles averages five such days per year and Portland averages eight.

ROUTES.—The route along the California-Oregon-Washington coast frequently must be navigated in thick weather. Most of the courses are long, and the effect of currents is uncertain. The radio direction-finder has given the navigator a means of determining his position in any weather; but there are conditions under which

691-231 O—63——7

radio bearings may be subject to error, so soundings should always be taken in critical places. A vessel equipped with an echo sounder may establish a fairly accurate position from continuous soundings.

San Diego to Strait of Juan de Fuca.—Vessels can proceed on rhumb lines through the following positions:

32°37′ N., 117°16′ W.; off San Diego.
33°40′ N., 118°18′ W.; off Los Angeles Harbor.
34°04′ N., 119°20′ W.; NNE of Anacapa Island.
34°25′ N., 120°29′ W.; off Point Conception.
34°33′ N., 120°42′ W.; off Point Arguello.
36°17′ N., 121°57′ W.; off Point Sur.
37°10′ N., 122°26′ W.; off Pigeon Point.
37°44′ N., 122°43′ W.; off San Francisco Bay.
37°58′ N., 123°03′ W.; off Point Reyes.
38°55′ N., 123°50′ W.; off Point Arena.
40°26′ N., 124°32′ W.; off Blunts Reef.
42°50′ N., 124°44′ W.; off Cape Blanco.
46°11′ N., 124°12′ W.; off Columbia River.
48°10′ N., 124°52′ W.; off Umatilla Reef.
48°26′ N., 124°47′ W.; off Cape Flattery.

Caution.—Strict adherence to tracks through positions listed above could result in collision of meeting vessels. It is suggested that southbound vessels shape courses through positions a mile farther off the mainland.

San Diego to Panama.—Proceed on rhumb lines through the following positions:

32°38′ N., 117°13′ W.
28°00′ N., 116°00′ W.
24°40′ N., 112°30′ W.
20°00′ N., 107°30′ W.
7°05′ N., 81°45′ W.

San Diego to Honolulu.—Rhumb line from 32°37′ N., 117°16′ W., to 21°14′ N., 157°39′ W.

Los Angeles to Honolulu.—Proceed on rhumb lines through the following positions:

33°40′ N., 118°18′ W.
33°44′ N., 120°07′ W.
21°14′ N., 157°39′ W.

San Francisco to Honolulu.—Rhumb line from 37°44′ N., 122°43′ W., to 21°14′ N., 157°39′ W.

Strait of Juan de Fuca to Honolulu.—Great Circle from 48°26′ N., 124°47′ W., to 21°14′ N., 157°39′ W.

Strait of Juan de Fuca to Unimak Pass.—Great circle from 48°31′ N., 125°00′ W., to 54°00′ N., 163°00′ W.; thence on rhumb line to 54°20′ N., 164°45′ W.

Pilots are available at most of the ports along the coast. Vessels requiring pilots should radio ahead and state probable time of arrival off entrance.

Towage.—Tugs are available at the principal ports. Arrangements for towage should be made by radio.

Supplies.—Large vessels usually take on fuel and other supplies in San Diego, Los Angeles and Long Beach Harbors, San Francisco Bay, Columbia River, or Puget Sound. Small-craft supplies are also available at many other places.

Repairs.—Major repairs can be made to large and small vessels in Los Angeles Harbor, San Francisco Bay, Portland, and Seattle. Motorboats and small yachts also can be hauled out and repaired, hull and engine, at other places.

Standard time.—California, Oregon, and Washington use Pacific standard time, which is 8 hours slow of Greenwich mean time. Example: When it is 10 a.m. at Greenwich it is 2 a.m. in the three coastal States.

Daylight saving time.—In all three States, clocks are advanced one hour on the last Sunday in April and are set back to standard time on the last Sunday in October.

4. SAN DIEGO TO POINT ARGUELLO, CALIFORNIA

Chart 5020.—The 240-mile irregular coast of southern California from the Mexican border to Point Arguello extends in a general northwesterly direction and includes the deep-water ports in San Diego Bay and San Pedro Bay. Several islands and dangers are from 10 to 95 miles offshore; they are described in Chapter 5.

Many restricted and danger areas are located in these waters; see Chapter 2 for limits and regulations. In addition, missile firing, gunnery, and bombing operations are conducted on and over offshore waters not included in the areas defined in Chapter 2, which at times may be hazardous to surface vessels. Information about these areas is published in Local Notice to Mariners issued by Commander, Eleventh Coast Guard District, Long Beach, California; Daily Memorandums, West Coast Edition, issued by Naval Branch Oceanographic Office, San Francisco, California; and Weekly Notice to Mariners, Part II (Pacific and Indian Oceans), issued by U.S. Naval Oceanographic Office, Washington, D.C.

Vessels are requested not to tow submerged objects across charted submarine transit lanes in use off the coast of southern California; times of transit are published in the Local Notice to Mariners.

Chart 5101.—In clear weather, vessels coming from the southward will sight Table Mountain, and its surrounding high land, and Los Coronados before picking up the San Diego landmarks.

Table Mountain (Chart 5020), conspicuous and flat-topped, is in Mexican territory, 25 miles southeastward of Point Loma and 6 miles inland.

Los Coronados (Coronado Islands) are four bare, rocky islands, extending 4.5 miles in a northwesterly direction, 7 miles offshore in Mexican waters, and 15 miles southerly of Point Loma. These islands are prominent in clear weather, and the passage eastward of them is commonly used by steamers. Depths in the vicinity of the islands are irregular, and in thick weather or at night caution must be observed when near them.

A light is shown from a white cylindrical masonry tower on the south end of the southerly island; it is obscured from certain directions by the northerly islands. Another light is shown from a white square masonry tower near the north end of the southerly island; local fog sometimes obscures it.

The boundary between the United States and Mexico is marked by a 14-foot white marble obelisk on a pedestal 41 feet above the water near the edge of a low table bluff. The visible marker is 200 yards from the beach and 10 miles 142° from Point Loma Light. A stone mound, 365 feet above the water and 1 mile eastward of the obelisk, marks another point on the boundary line. Directly northward of the obelisk the mesa falls to the low marshy land south of San Diego Bay.

Approaching from seaward in clear weather, San Clemente Island, the southernmost of the off-lying islands, will be sighted before seeing the distinguishing features of the coast. This will check the vessel's position and indicate subsequent shaping of the course for Point Loma. Upon a nearer approach, Cuyamaca Peak and the high land of the interior, Los Coronados, and Point Loma will be distinguished. Several aero lights in the vicinity of San Diego are visible from seaward.

Charts 5105, 5107.—San Diego Bay, where California's maritime history began in 1542, is 10 miles northwestward of the Mexican boundary. In September of that year, Juan Rodriguez Cabrillo, the Spanish explorer, sailed his frail bark into the bay. The bay is considered one of the finest natural harbors in the world, and affords excellent protection in any weather; it is free of excessive tidal current movements. A low, narrow sandspit, which expands to a width of 1.6 miles at North Island on its northwestern end, separates the bay from the ocean. An obstruction area, encompassing the remains of a concrete barge, extends 0.3 mile offshore 2.5 miles southeasterly of Coronado; mariners should remain well clear of the area. The waters off the entrance to San Diego Bay are included in a **restricted area**; limits and regulations are given in **207.612a,** Chapter 2.

The city of **San Diego** is on the northeastern shore of the bay. **Coronado** is on the sandspit opposite San Diego. **National City** and **Chula Vista** are on the southeast side of San Diego, and **Roseville** is on the west side of the city. The principal wharves are at San Diego. Coronado, connected to San Diego by passenger and automobile ferry, is of little commercial importance. National City has some waterborne traffic in oil. **A seaplane restricted area** is in the southern part of San Diego Bay; limits and regulations are given in **207.612,** Chapter 2.

Prominent features.—Point Loma, on the west side of the entrance to San Diego Bay, is a ridged peninsula with heights of about 400 feet. The ridge is bare of trees except in the gullies and where planted around the houses near the summit. The buildings and pier of a salt-water conversion plant about 500 yards north of Point Loma Light and some oil storage tanks on either side of it are conspicuous. Otherwise, the ridge is sparsely covered with grass, sagebrush, and cactus. At a distance it usually has the appearance of an island. **Point Loma Light**

(32°39.9′ N., 117°14.5′ W.), 88 feet above the water, is shown from a 70-foot white square pyramidal skeleton tower at the south end of the point; the station has a radiobeacon and fog signal. Thick kelp beds extend more than 1.5 miles southward of the point.

On a nearer approach, the abandoned lighthouse and a tower will be seen on the highest part of the hill immediately back of Point Loma Light. The old lighthouse and grounds comprise the **Cabrillo National Monument,** honoring the discoverer of San Diego Bay. Other prominent objects along the crest of the ridge are a large elevated tank, a standpipe, and a tall lookout tower 2.6 miles northward from the light.

North Island, the filled northwestern end of the sandspit on the eastern side of the bay entrance, is an aviation field. On its southeasterly side is the town of Coronado. Prominent features that show up well from the entrance are the south tower of Hotel del Coronado and the tower of the Naval Administration Building which is surmounted by an aero light which is operated intermittently with varying characteristics. In clear weather the skyline of the city of San Diego is very prominent on the southerly approach.

A measured nautical mile on course **018°49′** is off the west side of North Island; the markers are on shore.

Ballast Point, low and sandy, projects 0.4 mile northeastward from the eastern side of Point Loma, 1.3 miles northward from Point Loma Light. **Ballast Point Light (32°41.2′ N., 117°13.9′ W.)**, 16 feet above the water, is shown from a dolphin off the end of the point; the station has a fog signal. A long pier of the Navy submarine facility is 0.3 mile northwest of Ballast Point.

A jetty extends 1 mile southward on **Zuniga Shoal** from **Zuniga Point,** the southwest extremity of North Island. The outer two-thirds of the jetty has only small sections visible at high water; a lighted buoy marks the outer end.

A **degaussing station** is located in the **restricted area** between Ballast Point and Zuniga Point; limits and regulations are given in **207.612,** Chapter 2.

Boundary lines of inland waters.—The lines established for San Diego Bay are described in **82.157,** Chapter 2.

Channels.—In March 1962, the controlling depth was 41 feet in the buoyed channel into San Diego Bay to the Naval aircraft carrier turning basin on the northeast side of North Island. Depths to the major terminals on the **Embarcadero** are 35 feet or more. A depth of 30 feet can be carried southeasterly in the buoyed channel as far as the Navy repair base at National City, thence 14 to 20 feet to Chula Vista in South San Diego Bay.

Anchorages.—General anchorages, special anchorages, and anchorages for Government vessels have been established in San Diego Bay; limits and regulations are given in **202.1, 202.90,** and **202.210**, Chapter 2.

Vessels waiting outside the entrance for a pilot will find good anchorage in 36 feet or more eastward of the entrance buoys, although permission to anchor in the restricted area must be obtained from the local Naval authorities; see **207.612a,** Chapter 2.

The anchorage grounds westerly of the municipal piers are usually occupied by Naval vessels when the fleet is in home waters. Fore-and-aft moorings are required.

Aircraft warnings.—To avoid danger of collision between patrol planes and small boats operating in and out of San Diego, the Commandant, Eleventh Naval District, has promulgated the following measures:

When patrol planes are operating involving takeoffs and landings, there will be displayed on a hangar on the northeast end of North Island the International Danger Flag U by day and two vertical red lights by night.

Shipping should keep a sharp lookout for patrol planes at all times whether on the water, taking off, or landing, and give them a wide berth.

When flights are in progress the takeoff or landing area will be patrolled by boats. By day these boats will display a red flag and by night a red lantern. The waving of a red flag or red light at an approaching boat is to be construed as a danger signal. Boats so warned should look for and sight the plane or planes, and alter course as necessary, preferably hauling immediately to the side of the channel and waiting for a clear time to proceed.

Tides.—The mean range of tide is 4.1 feet at San Diego. The range between mean lower low water and mean higher high water is 5.7 feet. A range of about 9 feet may occur at the time of maximum tides. Daily predictions are given in the Tide Tables.

Currents.—The currents set generally in the direction of the channels. In the vicinity of the entrance the usual velocity varies from 0.5 to 3 knots depending upon the stage of the tide. Southward of the end of the jetty there is a slight set toward Zuniga Shoal on the ebb. Great care should be taken while passing Ballast Point as a vessel may take a sudden shear because of a cross-current deflected from Ballast Point.

The eddy usually encountered along the ends of the municipal piers makes docking difficult. The velocity and direction of the eddy are irregular and the greatest care must be exercised by even the most experienced. Strangers should not attempt to dock large vessels without a pilot.

See the Tidal Current Tables for daily predictions.

Weather.—The prevailing winds are from the northwest and west; the strongest are from the south and west in winter and early spring. The winds seldom exceed 25 knots, and shipping is considered safe at all times. Fogs occur occasionally, with heavy fog averaging about 30 days a year. These are mostly night fogs, and seldom occur between the hours of 9 a.m. and 6 p.m. See Appendix for **storm warning displays.**

Pilotage.—All foreign vessels and vessels from a foreign port or bound thereto, and all vessels sailing under register between the port of San Diego and any other port of the United States, are liable for pilotage.

Vessels sailing under enrollment and licensed, and engaged in the coasting trade, between the port of San Diego and other ports of the United States, are exempt from all pilotage, unless a pilot is actually employed.

A pilot in a small launch will meet vessels near the entrance buoy after the ship's agent or master has made

prior arrangements with the pilot office on the Tenth Avenue Terminal. Radio "PILOTS SAN DIEGO" giving estimated time of arrival. The pilot boat is stationed at the operation pier at the entrance to Shelter Island.

Towage.—Tugboats of all sizes are available from commercial operators. Naval tugs handle Navy vessels, but will assist commercial vessels in emergencies.

Quarantine is enforced in accordance with regulations of the U.S. Public Health Service. Vessels usually are inspected at the piers. Yachts, fishing boats, and small craft are inspected at the Embarcadero. The Public Health Service maintains an outpatient clinic.

Customs.—San Diego is the headquarters of the customs collection district and a port of entry; marine documents are issued. The boarding dock is on the Embarcadero.

Immigration officials are stationed at San Diego for the inspection of passengers and crews of incoming vessels engaged in the foreign trade. Such vessels are boarded by inspectors at the piers.

Harbor regulations.—Local rules and regulations for the Port of San Diego are enforced by a Port Director who is employed by the Harbor Department.

Wharves.—The **Port of San Diego** provides modern marine terminals with rapid cargo-handling facilities and equipment; 37 feet is maintained alongside the piers and docks. The Port operates two 1,000-foot cargo piers, and three 500-foot fishing vessel piers on the Embarcadero, and the 96-acre Tenth Avenue Marine Terminal.

The Tenth Avenue Marine Terminal has a concrete bulkhead with 37 feet alongside and berths for 9 large vessels. The dock has wide aprons, and spacious open and covered storage areas. Bunker stations at each berth can supply choice of three grades of bunker fuel and water while the vessel is loading and unloading.

The bulk cargo facility at the marine terminal has a capacity of 2,000 tons per hour. This includes a rotating car dumper and a bottom-drop unloader pit which accommodates four cars simultaneously. A conveyor belt transfers the bulk cargo to the mobile ship-loader, which travels the length of the bulk berth.

Supplies.—Fuel oil is available in any quantity at docks, or arrangements can me made to fuel from barges.

Fresh water is supplied at the wharves. Provisions and marine hardware are available in San Diego.

Repairs.—There are two major shipbuilding and repair yards in San Diego with drydocks of maximum capacity of 2,800 tons. The largest marine railway can haul out up to 1,000 tons. Machine shops and electronic service firms can make all kinds of topside, hull, and engine repairs.

Communications.—San Diego has direct transcontinental railway connection, and has communications with points north and south by rail and coastal vessels. It is a port of call for many of the intercoastal steamship lines. Several airlines maintain regular service into the city. The municipal airport is only a mile north of the municipal piers.

Small-boat facilities.—**Shelter Island,** across the channel from North Island and 1.5 miles above Ballast Point, includes the **Municipal Yacht Harbor** on the south and the **Commercial Basin** on the north. The yacht harbor can accommodate 1,500 boats at its piers, floats, and moorings. The entrance channel has depths of 20 feet to inside the entrance, thence 15 feeet to most of the facilities; the least depth is 10 feet. The commercial basin is the home port for scores of commercial fishing vessels. Repair yards in the basin have marine railways capable of hauling out vessels up to 150 tons. Both places have fuel and supply docks.

Harbor Island, across the channel from North Island and 3 miles from Ballast Point, was formed by the spoil dredged from the main channel. In 1962, the port had plans to develop moorings and slips for small craft as well as facilities for repairs and supplies.

Glorietta Bay, on the south side of Coronado and 6 miles from Ballast Point, has floats and moorings for more than 150 yachts and small craft. A marked 15-foot channel leads to the facilities. Available supplies include gasoline, lubricants, ice, and water.

Chart 5101.—The 80-mile coast between San Diego Bay and San Pedro Bay is thickly settled and the buildings of numerous towns and resorts are prominent from offshore. Several small-boat harbors and the port of Newport Bay are along the coast.

The first 11 miles of the coast, between Point Loma and Point La Jolla, is extremely rocky and the kelp beds extend up to 2 miles from shore; vessels should stay well offshore.

Mission Bay Park (Chart 5107), 5.5 miles north of Point Loma, is a large recreational small-craft bay. The jettied entrance channel depth was 19 feet in 1962 to the first bridge; depths of 20 feet are in **Quivira Basin,** the eastern arm, and 14 to 19 feet in **Mariners Basin,** the western arm. Moorings and slips are available for 1,500 craft. A marina in Quivira Basin has a Travelift and makes minor repairs; fuel and some supplies are available. Marked areas above the first bridge are restricted to sailing, skiing, and swimming. See Appendix for **storm warning display.**

Mission Beach, 6.5 miles north of Point Loma, is an amusement place with prominent buildings. From seaward the highest part of the roller coaster looks like a dome. An oceanographic tower, marked by lights and a fog signal, is 0.8 mile offshore.

Pacific Beach, 8 miles north of Point Loma, has a pleasure pier with a conspicuous motel on it.

A 2-mile rounding rocky point, 9 miles north of Point Loma, is the first high land north of San Diego Bay. The point is a spur from 822-foot **Soledad Mountain.** The southern end of this headland is called **False Point** and the northern end is **Point La Jolla.** In the vicinity of Point La Jolla, rock cliffs with caves rise abruptly from the water to heights of 80 feet. The buildings at La Jolla and Pacific Beach, and the television towers on Soledad Mountain are prominent.

Scripps Institution of Oceanography, one of the leading institutions in research in oceanography and marine biology, has extensive docks and facilities 12 miles north of

Point Loma. The institution maintains a long pier for observation purposes. A **restricted area** extends seaward from this pier; limits and regulations are given in **207.613,** Chapter 2.

Just northward of Scripps Institution the bluffs rise to a height of 300 feet, then decrease gradually for the next 5 miles to heights of 20 to 80 feet.

A **measured nautical mile** on course **000°** is 13.5 miles north of Point Loma; each range is marked by two steel towers.

At **Del Mar,** 18 miles north of Point Loma, a hotel with many gables is prominent.

The coast from Del Mar northward 31 miles to San Mateo Point is a low, flat tableland with abrupt cliffs 60 to 130 feet high and with broad low-water beaches. The tableland is intersected by numerous deep valleys with streams that usually dry in the summer. In the northern part, the high ridges of the interior are much nearer the coast. Paralleling this coast are U.S. Highway 101 and the Santa Fe Railway.

Carlsbad, 30 miles north of Point Loma, is a resort with several hotels. The stacks on the tall concrete buildings of the San Diego Gas & Electric Company near the south end of town are very prominent. The company maintains a lighted buoy 1 mile offshore and 5 large mooring buoys in a semicircle about 400 yards east of it. Mariners are cautioned to pass west of the lighted buoy. Near the north edge of town the low white square tower on the west end of the San Diego Army and Navy Academy is distinctive.

A pleasure pier at **Oceanside,** 32.5 miles north of Point Loma, extends out to the surfline. Oceanside Small-Craft Harbor, just north of the city, has a jettied entrance marked by lights. In 1963, fuel and services facilities were being installed; ultimately, the harbor will accomodate several hundred boats. The depths will be 20 feet through the entrance, thence 19 feet to the turn, and thence 14 to 9 feet at the heads of the two arms.

Camp Del Mar Boat Basin, 34.5 miles north of Point Loma, is part of a military reservation. Vessels in distress may enter the basin, but can be given no docking or mooring facilities except when in a sinking condition or to receive fuel from nearby commercial concerns. The entrance is protected by two breakwaters marked on the outer ends by lights; lights also mark the outer ends of the two inner groins. In 1962 the reported controlling depth into the basin was 15 feet. A **restricted area** is off the outer breakwater; limits and regulations are given in **207.613a,** Chapter 2.

An aero light, 0.5 mile north of Camp Del Mar Boat Basin, and an elevated tank, 1.5 miles eastward of the aero light, are prominent from well offshore. The highway bridge and trestlework of the railroad crossing of **Santa Margarita River,** just north of the light, also are prominent. The large white barn, 6.3 miles northwestward of the aero light, is conspicuous from seaward.

San Onofre Mountain, 44 miles north of Point Loma and 1.5 miles inland, is the highest of the coastal range in the area.

San Mateo Point, 47 miles northwestward of Point Loma, ends in cliffs 60 feet high, and is the northern head at the mouth of **San Mateo Creek.** Both San Mateo Creek and **Arroyo San Onofre,** a mile southeastward, are crossed by trestlework.

From San Mateo Point to Dana Point, 7.5 miles northwestward, the land is higher and more rugged, and is broken by **San Juan Capistrano Valley** and **San Juan Creek** about 1.5 miles eastward of Dana Point. The railroad and the highway run close together along the beach under the bluffs in this stretch of the coast to San Juan Capistrano Valley, where the railroad turns inland.

San Clemente, 2 miles northward of San Mateo Point, has many white houses with red-tiled roofs, making the place conspicuous from the sea. There is a small pleasure pier at the town.

Dana Point, 8 miles northwestward of San Mateo Point, is the seaward end of a high ridge. The spur forming the point ends in a moderately bold sandstone cliff 220 feet high with a precipitous broken face. Outlying rocks and ledges extend offshore for 350 yards. **San Juan Rock,** 10 feet high and about 50 feet in extent, is 340 yards southward of the highest point on the cliff.

San Juan Capistrano Anchorage, in the lee of Dana Point, provides some protection in about 3 fathoms for small vessels having local knowledge. Conspicuous along the beach are a concrete-deck pier, a white tower, and several buildings. In 1962, plans were announced for a small-craft basin at Dana Point. **San Juan Capistrano,** a small town 2.5 miles inland, is the site of the old mission founded in 1776. Some of the buildings are in fair preservation.

The 11.5-mile coast from Dana Point to Newport Bay is bold with rocky cliffs 40 to 100 feet high; these are the seaward ends of ridges separated by narrow, deep valleys. The summer resort of **Laguna Beach** is midway along this stretch.

Santiago Peak, 17.5 miles northeastward of Dana Point and visible 80 miles, is the dominant feature of this part of the coast; the peak is double-headed and dark in contrast with the immediate coastal range.

Chart 5108.—Newport Bay, 64 miles northwesterly of Point Loma, is an extensive lagoon bordered on the seaward side by a 3-mile sandspit. The bay is an important yachting and sport-fishing center, and offers excellent anchorage for large yachts and small craft under all weather conditions. The city of **Newport Beach** embraces the communities of **Newport** and **Balboa,** on the sandspit, and **Corona Del Mar,** east of the entrance.

The numerous houses and buildings of the area are prominent from seaward. A light-colored concrete school building with a tall tower is on the high ground 1 mile back from the beach.

The entrance to Newport Bay is between jetties 275 yards apart with lights at their outer ends. A radiobeacon and a fog signal are also on the outer end of the west jetty. A lighted bell buoy is off the entrance.

An offshore **measured nautical mile** on course **111°37′**

is 1.2 miles northwestward of the west jetty. The east range is marked by a front structure on an 800-foot pleasure pier and a rear structure on shore at Balboa Beach; the west range is marked by structures on shore at Newport Beach. Another 950-foot pleasure pier is 2.8 miles northwestward of the west jetty.

Boundary lines of inland waters.—The line established for Newport Bay is described in **82.155**, Chapter 2.

Channels.—In 1962, the controlling depth was 19½ feet in the main channel from the entrance to the turning basin northwest of **Lido Isle.** Elsewhere in the bay, depths are 10 to 20 feet.

Anchorages.—Temporary, recreational and small-craft, and commercial fishing vessel anchorages have been established in Newport Bay; limits and regulations are given in **202.1, 202.95,** and **202.212,** Chapter 2. Assignments are made by the harbormaster. Depths are from 10 to 17 feet.

Bridges.—There are no bridges over the main channel. None of the bridges to the islands in the bay restrict passage to the anchorage areas.

Dangers.—Parts of upper Newport Bay are restricted by speed and ski zones established by Orange County Harbor District.

Weather.—Severe storms are rare. The Santa Ana is an exceptional wind that blows from the northeast or east with great violence, although of short duration; see Chapter 3. **Storm warning displays** are listed in the Appendix.

Harbor regulations.—A Harbor Department controls the movement and berthing of vessels under the direction of a harbor manager; patrol and assistance craft operate on a 24-hour basis.

A search and rescue craft of the Coast Guard is stationed at the pier adjacent to the Harbor Department.

Wharves.—The numerous small wharves and landings in the bay are mostly for the use of fishing craft and yachts.

Supplies.—Fuel, water, marine hardware, and groceries are available at most of the facilities in the bay.

Repairs.—The largest marine railway in Newport Bay has a capacity of 325 tons and can haul out craft up to 150 feet in length. Machine shops are available. Several shipyards can haul out small boats for general repairs.

Communications.—There is rail, bus, and motortruck service to Los Angeles and points inland. The city of **Santa Ana** is 9 miles northward of Newport Bay.

Chart 5142.—The 20-mile coast from Newport Bay to Point Fermin is low and there are several lagoons near the beach. There are no trees near the shore; towns and resorts are almost continuous along the beach.

Huntington Beach State Park is a recreational area that extends 2 miles northwestward along the coast from the mouth of **Santa Ana River,** which is 4.5 miles northwest of Newport Bay entrance. The trestle crossing the mouth of this river is conspicuous. A buoy marks the seaward end of a terminal structure of a water conduit extending from shore 1.4 miles northwestward of Santa Ana River. The twin stacks of the Southern California Edison Company plant on shore are conspicuous from any direction.

A submerged oil pipeline extends nearly 1.2 miles seaward, 2.4 miles northwest of Santa Ana River; mooring buoys for tanker tie-ups are off the end of the pipeline. A lighted buoy marks the seaward limit. **Huntington Beach,** a resort 5 miles northwestward of Newport Beach, is identified by its many oil derricks. The city has a fishing and pleasure pier. **Sunset Beach** is a small town 5 miles northwestward of Huntington Beach. An elevated tank is near the western extremity of the town.

Chart 5148.—Anaheim Bay, 14 miles northwestward of Newport Bay, is the site of the U.S. Naval Weapons Station. Waters inside the jetties are within a **danger zone;** see **204.195,** Chapter 2, for limits and regulations. In 1962, the controlling depth was 23 feet in the channel to the basin. The channel is marked by a lighted range, and is protected by jetties with lights on the outer ends. A fog signal is also at the outer end of the westerly jetty.

In 1962, **Huntington Harbor,** a large marina basin, was under construction just south of Anaheim Bay.

Seal Beach, just northwestward of Anaheim Bay, has several resort structures and a 1,650-foot pleasure pier.

Alamitos Bay, 15 miles northwestward of Newport Bay, is the site of the Long Beach Marina. It is protected by stone breakwaters marked by lights. A fog signal is at the outer end of the westerly jetty. The city of Long Beach maintains 17 feet in the entrance and to the fueling station, and 12 feet in the remainder of the bay.

Berths in the marina are limited to 1,800 boats, but extensive parking and ramp-launching areas are provided for trailer-drawn craft. Visiting yachts are given moorage for overnight. A repair yard can haul out craft up to 350 tons for all kinds of hull and engine repairs, and any type and quantity of marine hardware can be obtained. A fueling station just inside the entrance pumps diesel fuel and gasoline, and provides lubricants, water, and ice. The marina is maintained and administered by the Long Beach City Recreation Department.

There is a 1,500-foot pleasure pier with a fog signal on the outer end at **Belmont Shore,** 1.8 miles northwestward of Alamitos Bay entrance.

Charts 5147, 5148.—San Pedro Bay, between Seal Beach on the east and Point Fermin on the west, is 82 miles northwestward of San Diego. On the shores of the bay are the city of **Long Beach** and the port areas of the city of **Los Angeles. Terminal Island,** in the northwestern part of San Pedro Bay, separates the outer bay from Los Angeles and Long Beach inner harbors. The bay is protected by breakwaters and is a safe harbor in any weather.

Los Angeles Harbor, at the western end of San Pedro Bay, includes the districts of **San Pedro, Wilmington,** and a major portion of Terminal Island.

Long Beach Harbor, in the eastern part of San Pedro Bay, is connected north of Terminal Island with Los Angeles Harbor by Cerritos Channel. The distance be-

tween the outer entrances to the two harbors is about 4 miles. Inner and Middle Long Beach Harbors are protected by two curving moles.

Both harbors have extensive foreign and domestic traffic, and ample modern port facilities for the largest vessels.

Prominent features.—San Pedro Hill (Chart 5142), 3.3 miles northwestward of Point Fermin, is the distinguishing feature for making San Pedro Bay from eastward or westward. The hill terminates seaward in steep, rocky cliffs about 60 feet high, with several horizontal terraces between them and the summit. On top of the summit is a large spherical structure.

Point Fermin, the southeastern extremity of San Pedro Hill, is a bold cliff about 100 feet high. A light is shown from a 30-foot white skeleton tower on the point.

A very conspicuous neon sign 130 feet above the ground at the Union Oil Company plant on the west side of Wilmington has the red numerals 76, 35 feet high, inside concentric circles of blue. The sign can be seen from south to east for 15 miles.

Signal Hill, Long Beach, rises to a height of 355 feet about 2 miles from the beach, and is readily recognized because of the many oil derricks around it.

The high concrete stack of a powerhouse at Seal Beach is an excellent landmark. It is flood-lighted at night and in clear weather is visible 15 miles in the daytime and 12 miles at night.

Several prominent objects of use to the navigator are the two tall, rectangular-shaped towers of the Commodore Schuyler F. Heim Bridge over Cerritos Channel; and the four western stacks of the Southern California Edison powerplant on the eastern end of Terminal Island.

In the central business district of Long Beach, conspicuous buildings include the Ocean Center Building with a yellow tower near the foot of Pine Avenue, a yellow hotel tower a block eastward of the Ocean Center Building, and a conspicuous white stone tower 0.4 mile eastward of the hotel.

Breakwaters.—San Pedro Breakwater extends about 0.9 mile in a southeasterly direction from the eastern side of Point Fermin, then turns northeastward for another 0.9 mile to Los Angeles Light. **Middle Breakwater** extends northeastward for 2.1 miles from the Los Angeles entrance, thence eastward for 1 mile to the Long Beach entrance, and is marked at both ends by lights. **Long Beach Breakwater** extends eastward 2.2 miles from Long Beach entrance and is marked by lights on both ends. Ranges for a **measured nautical mile** on course **090°** are on the Long Beach Breakwater. They are yellow diamond-shaped daymarks on iron pipes.

Los Angeles Light (33°42.5′ N., 118°15.0′ W.), 73 feet above the water, is shown from a 69-foot white cylindrical tower, black pilasters on concrete block, on the outer end of the San Pedro Breakwater. A radiobeacon and fog signal are at the station.

A light is shown from a white skeleton tower on a white concrete house on the west end of Middle Breakwater; a fog signal is at the light. **Long Beach Light (33°43.4′ N., 118°11.2′ W.),** 50 feet above the water, is shown from a 42-foot white rectangular tower on a white building on the east end of Middle Breakwater; a fog signal and radiobeacon are at the light. A light is shown from a white skeleton tower on the west end of Long Beach Breakwater, and a light is shown from a skeleton tower near the east end; fog signals are at the east and west lights.

Caution.—Outside the breakwaters, the approach to the Los Angeles Channel is marked by a lighted bell buoy and the approach to the Long Beach Channel is marked by a lighted whistle buoy. All inbound and outbound vessels should leave these buoys to port, should shape courses to about north or south before passing the buoys, and should proceed at speeds no greater than is necessary for steerage while making the entrances.

Vessels that approach the entrances close in and attempt to turn at or near the entrance are in danger of collision with outbound vessels, especially with smaller craft at night when their lights are not easily distinguishable at low tide or against the background of lights in the harbor.

Vessels awaiting a pilot should stay well to seaward and eastward of the outer fairway buoys.

Boundary lines of inland waters.—The lines established for San Pedro Bay are described in **82.145,** Chapter 2.

Channels.—The Long Beach Harbor main channel is maintained at 50 feet or more. In 1962–63, Los Angeles Harbor main channel was being dredged to 50 feet. The several inner harbor channels of each port are Federal project channels maintained at 35 feet.

Long Beach Channel is included in a **restricted harbor entrance area;** limits and regulations are issued by the Board of Harbor Commissioners, Port of Long Beach.

Fish Harbor, on the southern side of Terminal Island near its western end, is protected by two sets of breakwaters, the outer ends of which are marked by lights; a fog signal is at the offshore end of the western outer breakwater. A dredged channel with a controlling depth of about 22 feet leads between the outer and inner breakwaters to Fish Harbor, which has a controlling depth of about 18 feet. The seawall is lined with canneries and other fishworks. The outer breakwaters enclose the Yacht Club Anchorage, sometimes called the Fish Harbor Extension. This anchorage has depths of 22 to 25 feet easterly and depths of 11 to 14 feet westerly of the dredged channel.

Anchorages.—Limits and regulations of commercial, naval, explosives, and small-craft anchorage areas in San Pedro Bay are given in **202.1, 202.100,** and **202.214,** Chapter 2. When inside the breakwaters, vessels are required to anchor in the anchorage area prescribed in the regulations except in cases of great emergency. The Santa Ana is the only wind dangerous to vessels anchored inside the breakwaters.

Dangers.—A rock covered 3 feet is 0.3 mile east-southeastward of Point Fermin Light. A lighted whistle buoy is 0.2 mile southward of the rock.

Restricted areas are westerly and northerly of the Naval Base Mole south of Terminal Island, and a **seaplane restricted area** is in the eastern part of San Pedro Bay;

limits and regulations are given in **207.616, 207.617,** and **207.618,** Chapter 2.

Degaussing ranges are in the approach to the Terminal Island seaplane restricted area.

The entrance to **West Basin** north of San Pedro is obstructed on the north and south by broken piles which are the remains of a former railroad bridge. These obstructions extend channelward about 85 yards from the north shore and about 90 yards from the south shore. A channel 250 feet wide into the basin is marked by two lighted buoys.

Bridges.—In 1963, a high-level suspension highway bridge with a clearance of 185 feet over the center 500-foot width was under construction across Los Angeles Main Channel just below the turning basin, 3.2 miles above the entrance breakwater.

Two bridges cross Cerritos Channel on the north side of Terminal Island: Schuyler F. Heim Highway Bridge with span clearances of 39 feet down, and 164 feet up; and a railroad and highway bridge 25 yards westward with a double-leaf bascule span clearance of 11 feet.

Near the east end of Cerritos Channel are several power cables that have a clearance of 170 feet. Vessels are required to have a clearance of at least 6 feet under the cables to avoid the danger of arcing.

The retractable pontoon bridge over Back Channel between Long Beach Middle Harbor and Inner Harbor has a width of 170 feet.

Drawspan regulations for the bridges in Los Angeles and Long Beach Harbors are given in **203.1, 203.710,** and **203.711,** Chapter 2.

Tides.—The mean range of tide in Los Angeles Harbor is 3.8 feet and in Long Beach inner and outer harbors the mean range is 3.7 feet. The range between mean lower low water and mean higher high water is about 5.5 feet for these harbors. A range of about 9 feet may occur at times of maximum tides. The time of tide is about the same for Los Angeles and Long Beach Harbors. Daily predictions are given in the Tide Tables.

Currents.—The tidal currents follow the axes of the channels and rarely exceed 1 knot.

Surge.—Both Los Angeles and Long Beach Harbors are subject to seiche and surge. The most persistent and conspicuous oscillation has a period of approximately one hour. In the vicinity of Reservation Point and near the eastern end of Terminal Island, the hourly surge is very prominent, causing velocity variations which at times may be as great as a knot, and which often overcome the lesser tidal current so that the current floods and ebbs at half-hour intervals. Because of the more restricted channel, the surge through Back Channel at the east end of Terminal Island usually reaches a greater velocity than through the channel west of Reservation Point. In Back Channel, the hourly variation may sometimes be 1.5 knots or more. The hourly surge, together with other oscillations of shorter period and of more irregular occurrence, at times causes a very rapid change both in height of the water and the velocity and direction of the current and may endanger vessels tied up at the piers. A 3-minute surge is reported to be responsible for major ship movements and damage. Pilots advise taut lines to reduce the effect of the surge.

Weather.—Fogs occur throughout the year, but most frequently during the early spring and fall. Ordinarily they are of comparatively short duration, and occur during the night, clearing before 9 a.m. There are times, however, when the fog hangs in the inner channels for several days. The outer harbors usually are clear of fog first, then the inner channels gradually clear.

The only wind likely to be destructive is a local wind known as the Santa Ana (see Chapter 3).

See Appendix for **storm warning displays.**

Pilotage for Los Angeles and Long Beach Harbors is compulsory for foreign vessels and all vessels of 300 gross registered tons and over sailing under United States of America register. Vessels under enrollment, licensed and engaged in the coastwise, intercoastal, and fishing trades between the ports of Los Angeles or Long Beach and any other port of the United States, while under the control and direction of a pilot duly licensed under the laws of the United States for the ports of Los Angeles and Long Beach, are exempt from pilotage unless a pilot is employed.

Los Angeles Harbor Department has two pilot boats on station at all times. The pilot station is at the outer end of Pier 1. The pilot boats are equipped with radiotelephone and cooperate with the radar station at the pilot station. Vessels are met outside of Los Angeles Channel approach lighted bell buoy LA. The whistle signal for calling a pilot is one long and one short blast.

Pilots usually board the ship on the starboard side in normal weather. In southeasterly weather, when the sea is breaking in the entrance, they will board the vessel inside the breakwaters northeasterly of the westerly light of the Middle Breakwater. Vessels unable to make the entrance in foul weather should anchor eastward of the fairway on a bearing of 300°, or less, on the west end light on the Middle Breakwater.

Long Beach Harbor Department has pilots available at all times. The pilot station is on a jetty at the west end of Pier A Extension. The pilot boats are equipped with radiotelephone and operate cooperatively with the radar station at the pilot station. Pilots board one mile south of the harbor entrance. The whistle signal for calling a pilot is one short and one long blast.

Pilots for both harbors inter-communicate over UHF radio system KMB-466, 156.7 mc.

Towage.—Tugs are available. Large vessels usually have one or more tugs in attendance while berthing at or departing from the wharves along the inner channels.

Quarantine.—Quarantine for the ports is enforced in accordance with regulations of the U.S. Public Health Service. The quarantine station is on **Reservation Point** on the eastern side of Los Angeles Channel. Vessels subject to quarantine, customs, or immigration usually proceed to their docks for inspection. Fishing boats and other small vessels in quarantine proceed to the immigration dock on Reservation Point for quarantine and other visitation. Vessels from foreign ports entering for bunkers only will be boarded at the quarantine anchorage,

northwestward of Los Angeles Light. The Public Health Service maintains outpatient clinics in Los Angeles proper and in San Pedro.

Customs.—Los Angeles is the headquarters of the customs collection district and a port of entry; marine documents are issued.

Immigration.—The Immigration Station is on Reservation Point.

Harbor regulations.—Local rules and regulations for the Port of Los Angeles are enforced by a General Manager of the Harbor Department assigned by a Board of Harbor Commissioners.

Similar regulations for the Port of Long Beach are enforced by a Port Manager of the Harbor Department assigned by a Board of Harbor Commissioners. The **speed limit** for Middle Harbor and Inner Harbor is 6 knots.

Copies of the regulations may be obtained from the local office concerned.

Wharves.—The terminal facilities of Los Angeles Harbor and Long Beach Harbor can accommodate the largest vessels; depths of 35 feet or more are alongside the major facilities. Most of the wharves have huge apron and storage areas with rapid handling equipment.

The APL terminal, on the westerly side of Los Angeles main channel, just southerly of the turning basin, will handle cargo and passengers rapidly at different levels at the same time.

In 1962, the 311-acre Pier J was under construction on the east side of Long Beach Channel.

Supplies.—Fuel oil, water, provisions, and marine hardware can be had in any quantity at both Los Angeles and Long Beach. Fuel oil can be supplied at the oil docks or by barge.

Repairs.—Los Angeles Harbor is well equipped with marine repair plants; repairs of any size can be made. The largest drydock has a lifting capacity of 20,000 tons, 588 feet in length, 96 feet in width, and 26 feet over the blocks. There are no graving docks. The port is well equipped with wrecking and salvage facilities. A trained salvage crew and a corps of expert divers are in readiness at all times to render aid in any disaster to shipping along the coast and at distant localities.

Under-water diving requires a permit from the port warden for any method of under-water diving within Los Angeles Harbor.

Long Beach Harbor has repair facilities; a floating drydock of 3,000-ton capacity will accommodate vessels 280 feet in length. There are also marine railways for small craft.

Communications.—Los Angeles Harbor and Long Beach Harbor are ports of call for many foreign, intercoastal, and coastwise steamship lines. Rail and air lines serve the ports.

While the ports of Los Angeles and Long Beach are separate entities, their traffic facilities are closely interrelated.

Chart 5142.—From Point Fermin the coast trends in a general westerly direction 6.5 miles to Point Vicente, and forms the northern shore of San Pedro Channel, which is discussed in Chapter 5. From Point Vicente the shoreline curves northward. The coast is free of off-lying dangers and is well marked by kelp.

Several submarine sewers extend 1.3 miles offshore near **Whites Point,** 1.3 miles northwestward from Point Fermin.

The buildings ofthe Marineland Oceanarium on **Long Point,** 0.7 mile southeast of Point Vicente, are prominent from seaward. A 240-foot private pier is maintained for sport fishing and small-boat launching.

Point Vicente, 6.3 miles northwestward of Point Fermin, is a steep rocky cliff, 120 feet high, white and red in color, with red predominating. A rock awash is 250 yards southwestward from the point with kelp extending 100 yards farther to seaward. A small black 25-foot high pyramidal rock is close inshore 0.3 mile eastward of the point. **Point Vicente Light (33°44.5′ N., 118°24.6′ W.),** 185 feet above the water, is shown from a 67-foot white cylindrical tower on the southwesterly end of the point; a fog signal is at the station. The Coast Guard maintains a radio station near the light.

A **measured nautical mile** on course **304°40′** is offshore at Point Vicente. The range markers are on shore on both sides of the point.

A **danger zone** for practice firing extends off Point Vicente; limits and regulations are given in **204.197,** Chapter 2.

Chart 5144.—Palos Verdes Point, 2 miles north-northwestward of Point Vicente, is a bold, bluff point, 120 feet high, rising abruptly to the western extremity of Palos Verdes Hills. There are no dangers off the point, but heavy kelp extends out about 0.6 mile.

Lunada Bay is a small bight on the southern side of Palos Verdes Point. **Resort Point** forms the southern side of this bay.

Flat Rock Point, 1.7 miles northeastward of Palos Verdes Point, is on the southern side of Santa Monica Bay. A narrow spur protrudes from the otherwise rounded point. **Flat Rock,** 6 feet high, and **Bit Rock,** 5 feet high, are 175 yards and 250 yards, respectively, off the end of the spur. **Bluff Cove** is a shallow bight on the southern side of Flat Rock Point. The beach is covered with boulders.

Santa Monica Bay is formed by the curving coast between Point Vicente and Point Dume. From Flat Rock Point to Santa Monica the shore is comparatively low, consisting of sand dunes about 100 feet high backed up by the high mountains of the Sierre Madre far in the interior. The shores of Santa Monica Bay are free of outlying dangers, and the depths are comparatively shoal, the 10-fathom curve in general lying about 1 mile from shore, except at Redondo Beach where a deep submarine valley, **Redondo Canyon,** heads close to the shore.

There are several prominent objects in this vicinity. About 1 mile northward of Redondo Beach and about 200 yards inshore is a large powerhouse with six large smokestacks in a line parallel with the beach. The stacks are floodlighted at night. On Hermosa Beach is a 7-story white concrete beach club, surmounted by an elevator penthouse. Numerous white tanks within the extensive

oil refinery area in El Segundo can be seen from seaward. The twin stacks of a powerplant at the south edge of town and the lone striped stack about 1 mile north are quite prominent. An aluminum-colored water tank is on the southern pier at Venice. In the city of Santa Monica are an aluminum-colored gas holder and a terra-cotta office building, surmounted by a tower upon which blazes a huge neon sign.

Malaga Cove, just northward of Flat Rock Point, is used occasionally by fishing boats with local knowledge, but it is open to the prevailing westerly winds. Boats enter through a break in the kelp and anchor inside in 6 to 7 fathoms, with the south point of the cove bearing 207°.

Redondo Beach, 6 miles northward of Point Vicente, is the site of a large man-made small-craft basin. Known as Redondo Beach King Harbor, the basin will accommodate hundreds of pleasure and fishing craft. The entrance, marked by a lighted bell buoy and a light on the south end of the north breakwater, has depths of 28 to 30 feet; the three mooring basins have depths of 8 to 15 feet. Available supplies include fuel, water, groceries, and marine hardware. Facilities include a repair yard with 60-ton Travelift, ramp launchers, and parking and shopping areas; general repairs can be made to hulls and engines. Several sport-fishing barges usually anchor 1 to 2 miles offshore during the summer months. See Appendix for **storm warning display.**

Boundary lines of inland waters.—The line established for Redondo Harbor is described in **82.153,** Chapter 2.

Submarine oil seepage.—About 1.5 miles off Redondo, in the deep water of Redondo Canyon, there is a submarine oil seepage and the water surface is often covered with a film of petroleum. Gas bubbles have been reported in several locations in this vicinity. A second seepage 3.5 to 4 miles to the northwestward is more noticeable and more continuously in action. On calm days, globules and large blobs of oil have been seen projected clear of the water surface. Gas also escapes continuously in large bubbles often 3 to 6 inches in diameter.

Hermosa Beach and **Manhattan Beach** are resorts continuing northward between Redondo Beach and El Segundo; the pleasure pier at Manhattan Beach, 2.5 miles northward of Redondo Beach, extends 300 yards from shore.

About 2 miles northward of Manhattan Beach an oil-loading wharf extends out to a depth of 28 feet. There are submerged oil-pipelines extending out north and south of the wharf; mooring buoys off the wharf and ends of the pipelines serve the tankers. A bell buoy is farther offshore. On shore, just south of the wharf, is a powerplant with prominent twin stacks. The water intake obstructions northward of the wharf are marked by buoys.

El Segundo, 1 mile inshore from the oil wharf, has extensive oil refineries. Nearly 100 large white oil tanks on the high ground are prominent. An aero light is 2.5 miles inshore at El Segundo.

A restricted area extends about 7 miles offshore at El Segundo; see **207.619,** Chapter 2, for limits and regulations. A large flood-lighted concrete stack 200 feet high, at the sewage disposal plant just north of El Segundo, is very conspicuous.

Marina del Rey, 13.5 miles north of Point Vicente and 3.5 miles southeastward of Santa Monica, is a small-craft harbor administered by the County of Los Angeles. The entrance is marked by a lighted whistle buoy a mile offshore and by lights on the ends of the jetties and inside. Depths into the harbor and basin are at least 10 feet. Berths, fuel, water, and marine supplies are available. See Appendix for **storm warning display.**

Boundary lines of inland waters.—The line established for Marina del Rey is described in **82.151,** Chapter 2.

Santa Monica, 17 miles northward of Point Vicente, has a large pleasure pier which extends out to a depth of about 22 feet, but there is no water commerce. The buildings and structures along the beach are prominent. Fuel oil and gasoline are available. A 0.3-mile long breakwater, parallel to the beach, is about 200 yards off the outer end of the pier. A light is shown from the top of a building on the outer end of Santa Monica Wharf; a fog signal is at the light. A lighted bell buoy is southwestward of the breakwater. See Appendix for **storm warning display.** A **special anchorage area** for small craft is off the pier; limits and regulations are given in **202.1** and **202.110,** Chapter 2.

Chart 5101.—The 16-mile coast between Santa Monica and Point Dume, is bold, rocky, and rugged. Steep cliffs rise abruptly from the water's edge, ascending gradually within 3 or 4 miles to the summits of the Santa Monica Mountain Range, about 3,000 feet high. The seaward termination of this range is at Point Mugu, 14 miles westward of Point Dume.

Kellers Shelter, 9 miles westward of Santa Monica, is an open bight offering protection from northerly and westerly winds in 5 to 7 fathoms, sandy bottom. A reef marked by kelp extends a short distance offshore about 0.5 mile westward of the anchorage.

A fishing and pleasure pier, 700 feet long with 15 feet of water at its outer end, is on the western side of Kellers Shelter. Twin white buildings are prominent marks at the outer end of the pier. Private mooring buoys are maintained east of the pier for the use of sport fishing boats which leave for the nearby fishing grounds daily except during winter months. An aero light is about 2 miles northward of the beach at Kellers Shelter. Frequently the headlights of automobiles on the highway along the beach are directed toward the sea.

Paradise Cove, 2 miles northeastward of Point Dume, affords protection similar to Kellers Shelter. The anchorage is abreast the fourth break or arroyo in the cliffs from Point Dume, and is immediately outside the kelp line, in 6 to 7 fathoms, sand bottom, with Point Dume bearing 240°. Kelp should be avoided on account of possible dangers. A 400-foot pleasure pier and several moorings for small boats are in the cove. A fog signal is atop a building about halfway out on the pier.

Point Dume is the seaward end of a rather low plateau that terminates in a dome-shaped head, about 200 feet high, rising from a bold rocky bluff. The bluff is reddish,

with white cliffs eastward and westward. A small bare rock is 150 yards southward of the point, and a reef which uncovers is 150 yards farther out. A lighted whistle buoy is 0.5 mile off the point.

Dume Canyon is a submarine valley with extremely steep slopes running about 0.3 mile offshore from Point Dume, and extending northwestward roughly parallel to the beach. Moderately strong currents of a confused directional nature have been observed in the vicinity of this submarine valley.

Chart 5202.—The 14-mile coast between Point Dume and Point Mugu is very rugged and there are no outlying dangers. About 2 miles eastward of Point Mugu, on the beach at the foot of a very high bluff, is a 140-foot sand dune. This is quite prominent and can be made out on clear moonlight nights. About 0.5 mile farther eastward is a pleasure pier extending out to the surf.

Point Mugu (Chart 5007), the seaward termination of the Santa Monica Mountains, is prominent on account of the lowland of the Santa Clara Valley to the westward. The cuts and fills of the highway which skirt the shore from Point Mugu eastward are prominent. Aluminum-colored twin tanks, 1.5 miles northwestward of the point and on the western slopes of Laguna Peak, show well from southeastward through west.

Caution.—The U.S. Navy advises navigation interests and others that extensive guided-missile firing operations may take place in the Pacific Missile Range, Point Mugu, Calif., Sea Test Range, daily Monday through Friday from sunrise to sunset until further notice. The test area extends for 170 miles in a southwesterly direction from Point Mugu and is up to 100 miles wide. The specific danger portions of the firing area are broadcast daily Monday through Friday at 9 a.m. and 12 noon on 2638 kc and 2738 kc.

A **danger zone** for a Navy small-arms firing range extends about 2 miles offshore at Point Mugu; limits and regulations are given in **204.201a**, Chapter 2.

Mugu Canyon is a submarine valley with its head near Mugu Lagoon. The 50-fathom curve is about 0.5 mile offshore.

Santa Barbara Channel is discussed in Chapter 5.

Chart 5007.—**Point Hueneme,** 53 miles northwestward of Point Fermin, is low, rounding, and sandy; it is the outermost point of the low land of the Santa Clara Valley. **Point Hueneme Light (34°08.7′ N., 119°12.5′ W.)**, 52 feet above the water, is shown from a 48-foot buff square tower on the fog signal building on the point; a fog signal is at the station. Other landmarks include a large yellow building 500 yards east of the channel, a large oil tank the same distance west of the channel, and two elevated tanks along the shore northwestward of the jetties. The aero light at Oxnard, 3 miles to the northward, is a good night mark.

Port Hueneme, a basin inside Point Hueneme protected by jetties, is used by cargo vessels and commercial and sport fishing craft. The western jetty has a light at its outer end. A lighted bell buoy is off the end of the eastern jetty. A lighted range and lights mark the channel.

Boundary lines of inland waters.—The line established for Port Hueneme is described in **82.149,** Chapter 2.

The entrance channel has a controlling depth of 35 feet and inside depths range from 28 to 33 feet. A small-boat basin at the north end of the harbor has depths of 10 to 15 feet.

The harbor at Port Hueneme is under the jurisdiction of the U.S. Navy. All vessels over 300 gross tons are required to have a pilot holding a Federal pilot's license for Port Hueneme to enter. Harbor pilots are employed by the U.S. Navy. A request for a pilot should be made to the Marine Department, U.S. Naval Station, Port Hueneme, Calif. Vessels will lay-to 1 to 2 miles off the entrance to be boarded by a pilot.

The bulkhead wharf on the southern side of the central basin, which is used by merchant vessels, has a transit shed and railroad tracks. It is under the control of the Oxnard Harbor District. Fresh water is available on the wharf; diesel oil, gasoline, and marine supplies can be obtained locally. See Appendix for **storm warning display.**

In 1962, construction was under way on a new small-craft harbor, known as **Ventura County Harbor,** near **Hollywood by the Sea,** a mile northwestward of Port Hueneme. The Federal project provides for a jettied channel 20 feet deep into mooring basins of the same depth inside. The jetties and offshore breakwater have been completed and are marked by lights.

A row of cottages extends northwestward along the beach for 2 miles from Point Hueneme. From the point, low sand beaches and dunes trend northwestward for 9 miles to the mouth of the **Ventura River.**

A 209-foot stack 0.6 mile northward of **Mandalay Beach** is conspicuous throughout the area. A private lighted buoy is 1.1 miles to the westward of the stack.

Ventura, 8.5 miles northward of Point Hueneme, has a 1,960-foot wharf with 19 feet of water at the outer end and 18 feet at the inner end of the 250-foot loading face. The outer end of the wharf is marked by a light. Fresh water is piped to the wharf and gasoline is available in the town.

In 1962, the city of Ventura began construction of a small-craft marina just south of the city. Lights mark the jettied entrance; a fog signal is on the south jetty.

Small pleasure and fishing boats anchor eastward of the wharf during the summer, but the anchorage is not safe in winter and spring because of southwesterly swells and comparatively shallow water. Vessels anchor anywhere in the bight with good holding ground, but there is no protection.

The buildings in the town, the oil tanks at the inner end of the wharf, and the railroad trestle crossing Ventura River immediately west of the town are prominent features in approaching. **Padre Junipero Serra's Cross,** on a 350-foot hill immediately northwestward of the center of the town, may be seen from the anchorage. There are several aluminum-colored tanks and many oil derricks

high up the slopes of the hills northwestward of the town. Radio towers in the southeast part of town are conspicuous. An aero light is 5 miles northwestward of Ventura. A lone oil derrick is close eastward of the light.

A submarine pipeline to floats about 1.5 miles southward of the wharf is used for loading fuel oil. A group of storage tanks marks the inshore end of the line. Another submarine pipeline to floats westward of the wharf is used for loading gasoline and fuel oil. Several large mooring buoys are maintained for the tankers loading from the floats. A lighted whistle buoy is 1 mile southwestward of the wharf.

Chart 5202.—From Ventura River, the **Santa Ynez Mountains** extend to Point Conception and Point Arguello. For 10 miles westward from the river to Rincon Point the coast is very rugged, elevations of over 2,000 feet being found within 1 mile of the beach. The dangers do not extend over 0.5 mile from the beach which is well fringed with kelp. Between Ventura and Santa Barbara there are several small towns, and the highway and railroad skirt the shore; retaining walls are a common feature.

Pitas Point, 5.5 miles northwestward of Ventura, is the first bold point westward of Ventura River. A very steep gulch is on its western side. Eastward of the point is a mile of beach cottages. High on the steep slopes above the cottages are the derricks and tanks of an oil field. Aluminum-colored tanks and oil-processing plants are prominent a mile east of the point; and the aero light on the hilltop above the tanks is a good mark at night.

Punta Gorda, 9 miles northwestward of Ventura, is low at its outer extremity but rises rapidly to prominent **Rincon Mountain.** Eastward of the point is a long pier supporting many oil pumps. Two derricks are conspicuous on the outer end of the pier. Tanks and numerous derricks are along the highway just east of the pier. West of this pier a causeway extends southerly from Punta Gorda for 0.5 mile to an artificial island used for oil operations. A light and fog signal are on the island.

Rincon Point, 11 miles northwestward of Ventura, is low and sandy. **Sand Point,** 3.5 miles westward of Rincon Point, is low and rounding, with the narrow opening to **El Estero,** a lagoon of no importance lying close under and eastward of it. A rock that uncovers is 550 yards offshore from Sand Point. Oil-drilling platforms are off Sand Point.

A light-colored clubhouse and short pier on the beach at the eastern side of **Carpinteria,** 8 miles eastward of Santa Barbara, are prominent. An aluminum-colored water tank may be seen among the buildings of the town. A submerged pipeline leads to mooring buoys 0.6 mile offshore where tankers are loaded. Storage tanks mark the inshore end of the pipeline.

Ortega Hill, just westward of **Summerland** and 18 miles northwestward of Ventura, is 250 feet high and conspicuous because of the extensive cuts for the highway; from offshore it has the appearance of a large slide.

Chart 5261.—Santa Barbara, 29 miles northwestward of Point Hueneme and 39 miles east of Point Conception, is the yachting center for this section of the coast. The harbor is used mostly by fishing and pleasure boats. **Lavigia Hill,** 0.6 mile northeasterly of Santa Barbara Light, is 459 feet high and the distinguishing feature in approaching Santa Barbara from eastward or westward.

Point Castillo, the eastern extremity of Lavigia Hill, extends from an almost perpendicular cliff about 50 feet high. **Santa Barbara Point,** the southeastern end, is a high cliff and is the eastern limit of the narrow tableland. **Santa Barbara Light (34°23.8′ N., 119°43.3′ W.),** 142 feet above water, is shown from a 24-foot white tower 1 mile westerly of the point.

Conspicuous landmarks are St. Anthony's Seminary Spire, the neon-lighted theater spire in the center of the town, the neon-lighted hotel tower on the beach 1 mile eastward of the town, and the many residences on the hillsides back of the town. At night the electric lights of Santa Barbara are prominent from the channel, but they are obscured from the westward by Lavigia Hill.

East of Stearns Wharf is a measured course 6,080 feet long on bearing 81°57′40″, the front structures are diamond targets on iron masts, and the rear structures are square targets on iron masts.

Boundary lines of inland waters.—The lines established for Santa Barbara Harbor are described in **82.147,** Chapter 2.

The harbor at Santa Barbara is formed by a 750-yard angular breakwater extending from Point Castillo on the south and 680-yard **Stearns Wharf** on the north. A light marks the outer end of the south breakwater, and a light and fog signal are on the outer end of the north wharf. The south breakwater is also lighted at night, but at times the lights are difficult to see against the background of city lights.

Depths are about 15 feet in the buoyed channel into the harbor, but after storms the channel may shoal to 6 feet or less.

Anchorage may be had inside the kelp, but large vessels anchor outside of it in better holding ground.

Small boats anchor in the basin behind the breakwater in a **special anchorage area;** limits and regulations are given in **202.1** and **202.115,** Chapter 2. The holding ground is good. Mooring space is assigned by the harbormaster, who has an office on the waterfront.

The prevailing winds are westerly. Southeasterly gales occur occasionally during the winter. See Appendix for **storm warning display.**

Boat landings, launching ramps, and small-boat hoists are on the western side of the harbor where water, gasoline, and oil are available at float landings. Marine hardware and general supplies are also available here.

The U.S. Naval Reserve training station is at the long pier on the west side waterfront. Wharfage can be obtained at this pier, charges being paid to the city of Santa Barbara. A Coast Guard rescue vessel is stationed here.

Stearns Wharf has 18 to 24 feet alongside. Diesel oil,

gasoline, and fresh water are available on the wharf. A 30-ton hoist on the wharf can handle boats up to 60 feet in length. Engine and hull repairs can be made.

Communication is by rail, motor vehicle, and plane. The Santa Barbara Municipal Airport is at **Goleta,** 7 miles west of the harbor.

Chart 5202.—The 8-mile coast from Santa Barbara westward to Goleta Point consists of bluffs 30 to 100 feet high with short stretches of sand beach and is fringed with kelp 0.2 mile offshore. There are no dangers.

Goleta Point, 6.2 miles westward of Santa Barbara Light, is low and terminates in a cliff about 30 feet high. The aero light 1 mile northeastward and the two lighted radio towers 1.5 miles northeast of the point are good marks at night. A short pleasure wharf is in the bight east of the point.

The 32-mile coast from Goleta Point to Point Conception is more rugged than that eastward. **Gaviota Canyon** 12 miles eastward of Point Conception, is a conspicuous break in the mountains back of this coast. A railroad skirts the shore over trestles and embankments which cross the mouths of numerous gulches and arroyos. The kelp grows quite heavily, and in some places extends over a mile offshore. The Pacific Highway parallels the coast from Santa Barbara to Gaviota, where it turns inland.

Oil well production heads covered 6 fathoms or more and submerged pipelines to shore extend as much as 3 miles offshore between Goleta Point and Point Conception. Several oil well structures in the area are lighted and equipped with fog signals.

Coal Oil Point, 1.8 miles westward of Goleta Point, is low and may be distinguished by the strong odor of petroleum discharged by a spring. This odor is noticeable over 2 miles offshore.

Ellwood oil field, 2 miles northwestward of Coal Oil Point, extends more than 1 mile along the shore and is marked by numerous wharves and many tall derricks. One wharf has a length of more than 2,000 feet. Several large tanks may be seen on the bluffs above the beach. Large tankers call frequently for oil at the submarine pipeline off the wharves. The moorings are in about 10 fathoms, sandy bottom.

A rock covered 15 feet is 3.7 miles westward of Coal Oil Point and 0.9 mile offshore; it is surrounded by kelp. This rock is the outermost danger along the north side of the Santa Barbara Channel.

Capitan, 7.5 miles westward of Coal Oil Point, is in a small bight which offers little protection to small craft. About 1 mile northwestward of Capitan a submerged pipeline extends seaward 1 mile, where there are large mooring buoys for tankers receiving oil. There are few tanks on the bluff above the pipeline, and a lone tank stands on a bare hill 500 feet high and 0.3 mile inland.

Refugio Beach at **Orella,** 2.5 miles westward of Capitan, is a small auto camp at the mouth of the canyon. A small bight here offers some protection for small boats in northwesterly winds in about 15 feet.

A submarine oil-loading terminal is at **Gaviota,** 13.5 miles eastward of Point Conception. A number of large white storage tanks mark the inshore end of the pipeline. About 1 mile west of Gaviota is a state beach park with a 545-foot pleasure-fishing pier. An electric hoist for launching skiffs is available. The railway trestle along the beach is quite prominent. An aero light is 3 miles northeastward of Gaviota. This light has been reported seen by ships at distances of more than 60 miles; it should not be confused with the marine aids to navigation, particularly those on the Channel Islands.

Cojo Anchorage, 1.5 miles eastward of Point Conception, affords protection off the mouth of the Cojo Valley from moderate westerly and northwesterly winds. The suggested anchorage is opposite a culvert, under the railroad tracks, about 1.5 miles east of Point Conception Light, in 5 to 10 fathoms, hard sandy bottom. The cove 1.7 miles eastward of this anchorage known as Little (Old) Cojo, is foul and affords little protection.

Point Conception, 118 miles northwestward of Point Fermin and at the western end of Santa Barbara Channel, is a bold headland 220 feet high that marks an abrupt change in the trend of the coast. There is comparatively low land immediately behind it. At a distance from northward or eastward, it usually looks like an island. **Point Conception Light (34°26.9′ N., 120°28.2′ W.),** 133 feet above the water, is shown from a 52-foot white tower behind a dwelling near the western part of the point; a fog signal is at the station. A low black rock, nearly awash at high tide, is 220 yards offshore, southward and westward of the light.

A **danger zone** of the Point Mugu Missile Range has been designated in the Pacific Ocean between Point Conception and Point Sal; limits and regulations are given in **204.202,** Chapter 2.

Point Conception has been called the **Cape Horn of the Pacific** because of the heavy northwesterly gales encountered off it during the passage through Santa Barbara Channel. A marked change of climatic and meteorological conditions is experienced off the point, the transition often being remarkably sudden and well defined. When the northwesterly winds are strong they blow down the canyons between Point Conception and Capitan, and cause heavy offshore gusts.

From Point Conception, the coast trends in a gentle curve northwestward for 12 miles to Point Arguello, and consists of bold rocky cliffs, 100 to 400 feet high. The coast railroad runs along these cliffs and through several tunnels.

The 100-fathom depth curve off Point Arguello, and to a lesser extent off Point Conception, is characterized by a succession of indenting deeps or gorges. In following the curve during thick weather with an echo sounder, these submarine features should be found extremely useful.

Espada Bluff is a prominent cliff 370 feet high, 5.5 miles northward of Point Conception. The cliffs on each side drop sharply to less than 100 feet in height.

Tranquillon Mountain, near the seaward end of the Santa Ynez Mountains, is prominent in clear weather. It

terminates in Rocky Point, Point Arguello, and Point Pedernales.

Rocky Point, 1.2 miles south of Point Arguello, has numerous detached rocks extending in some cases 300 yards offshore.

Point Arguello is a narrow, jagged, rocky projection, extending about 800 yards westward of the general trend of the coast. An outlying rock is about 200 yards seaward. The extremity of the point overhangs the water's edge, and about 200 yards inshore the point is nearly divided by gullies on the northern and southern sides. These form a saddle which, from northward and southward, looks like two heads. **Point Arguello Light (34°34.6′ N., 120°39.2′ W.)**, 124 feet above the water, is shown from a 48-foot white skeleton tower on the western extremity of the point. A radiobeacon and fog signal are at the station. **Point Arguello Loran Station** (slave) is about 0.6 mile northeasterly of the light.

5. CHANNEL ISLANDS, CALIFORNIA

Chart 5020.—The eight islands extending for 130 miles in a northwesterly direction off the coast of southern California from San Diego to Point Conception are known as the **Channel Islands.** They include the four islands of the southern group—San Clemente, Santa Catalina, San Nicolas, and Santa Barbara; and the four islands of the northern group also referred to as the **Santa Barbara Islands**—Anacapa, Santa Cruz, Santa Rosa, and San Miguel.

In approaching from the southward, there are several banks encountered before reaching the Channel Islands. **Sixtymile Bank,** 62 miles southwestward of Point Loma, has a least depth of 53 fathoms over it. Differences of 3° or more from the normal magnetic variation have been observed within a radius of 8 miles of this bank.

Chart 5101.—Bishop Rock, on which the clipper ship BISHOP struck in 1855, is covered only 2½ fathoms and is the shallowest point on **Cortes Bank.** The rock, marked by a lighted whistle buoy, is in 32°27′ N., 119°08′ W., 40 miles southwestward of San Clemente Island, and is the farthest outlying danger along the coast. The currents are largely nontidal in character; velocities between 1 and 2 knots have been measured. These currents cause considerable swell and even in moderate weather the sea usually breaks at this rock.

The area for about 2.5 miles southeastward of Bishop Rock shoud be avoided because of the broken bottom. Deep-draft vessels should also avoid a 9-fathom spot 5 miles west-northwestward of the rock where the bottom is extremely broken, although no breakers have been reported.

Tanner Bank covers an area about 15 miles long in a west-northwesterly direction and about 5 miles wide. The least survey depth over it is 12 fathoms, but in December 1945 a depth of 9 fathoms was reported in 32°42′ N., 119°08′ W. The northwestern end of the bank is 28 miles southeastward of San Nicolas Island.

A bank covered 52 to 70 fathoms is 18 miles northwesterly of Tanner Bank. The bank extends 9 miles in a northwesterly direction and has an average width of 2 miles. The bottom is hard with fine gray sand and shells. The bank is fished extensively during the winter season.

Chart 5111.—San Clemente Island, 43 miles south-southwestward of Point Fermin and 57 miles west-northwestward of Point Loma, is 18 miles long in a northwesterly direction, has a greatest width of 4 miles, and has greatest elevation of 1,965 feet. The island is a U.S. Naval Reservation and is closed to the public. Vessels including yachts and fishing craft, are warned that the vicinity of the island may be dangerous at any time on account of naval activities, including gunfire, bombing, and rocket firing.

Local magnetic disturbance.—Differences of as much as 5° from normal variation have been observed up to 3 miles offshore along the north, east, and south coasts of the island.

The top of the island appears as a tableland from a distance, and presents no definite natural features of value to navigation.

The northeastern side of the island is bold, with rocky cliffs. The water is generally deep close inshore, and kelp grows close to the beach. On this side of the island a prominent white rock is close inshore, 6 miles northwestward of Pyramid Head. On the beach behind this rock is a fresh-water spring, the only one available during the dry season.

The southwestern side of the island is more irregular, but it is lower and has more gentle slopes. Here the kelp extends several hundred yards offshore, and generally to or beyond the 10-fathom curve. Rocks are numerous close inshore and inside the kelp, but outside the kelp line the bottom slope is more gradual than on the other side of the island, and there are many places where vessels might anchor safely in the lee of the island during the northeastern storms, known as the Santa Anas.

Seal Cove, on the southwestern side of the island midway between the two ends, affords a boat landing and indifferent anchorage for small craft in northwesterly weather.

Outer Santa Barbara Passage lies between San Clemente and Santa Catalina Islands.

Chart 5117.—China Point is the southwestern extremity of San Clemente Island and on the western side of Pyramid Cove. A light is shown from a white pyramidal structure on the point.

Pyramid Cove, the deep bight in the southern end of San Clemente Island, offers protected anchorage in 10 fathoms or more during northwesterly weather. The cove is included in a ***danger zone***; limits and regulations are given in **204.200,** Chapter 2. Vessels should not enter the kelp as there are indications of other dangers besides those already shown on the charts. Some swell makes into the cove most of the time, but landing on the beach is usually not difficult.

Pyramid Head, the southeastern point of San Clemente Island and the eastern side of Pyramid Cove, is about 900 feet high, sharp, jagged, and prominent. A light is shown from a white pyramidal structure on the head.

Chart 5118.—Wilson Cove, on the northeastern shore of San Clemente Island, 15.5 miles northwestward of Pyramid Head, is a fair anchorage in the prevailing westerly weather, but is uncomfortable at times as the swells make around the point from the northwestward. A strong wind usually blows down off the hills in the afternoon. **A restricted anchorage area** and a **naval restricted area** are in the vicinty of the cove; limits and regulations are given in **202.218** and **207.614,** Chapter 2.

Three lights shown from white pyramidal structures and a lighted range are in the vicinity of Wilson Cove. One is on the hill on the southwestern side of the cove, another 2 miles south of the cove, and the other 1 mile north of the cove. The range lights are in line with the Navy pier on bearing **198°.** A fog signal is on the end of the pier.

The buildings on the hill overlooking Wilson Cove are prominent from the southeastward. The best anchorage for small craft is in the lee of the kelp making off from a point nearly a mile northwestward of the wharf.

In the middle of Wilson Cove the U.S. Navy has a steel pier that extends 550 feet from shore. A landing section at its outboard end is 38 feet wide by 210 feet long, with its deck 18 feet above low water. Depths along the landing section vary from 14 feet inboard to 24 feet outboard. Two fixed breast moorings are in place on each side opposite the landing section and should be used to avoid danger of damage from surge. Time of the tide is about the same as that for Los Angeles. The mean range is 3.5 feet.

Northwest Harbor, on the northwestern end of the island, affords shelter in southerly weather and is a comfortable anchorage in the prevailing westerly weather, as the large beds of kelp and the low islet to the northward of the anchorage afford protection. It is open northward, and is unsafe in heavy northwesterly weather.

A light is shown from a white pyramidal structure on the headland at the north end of San Clemente Island.

A line of rocks extends westward from the northwestern extremity of San Clemente Island, terminating about 0.4 mile off the point in bold and rocky **Castle Rock.** A **danger area** for aerial bombing, rocket firing, and strafing extends 300 yards around this prominent islet.

West Cove, on the northwest side of San Clemente Island 1.5 miles southeastward of Castle Rock, offers some shelter from Santa Ana winds.

A danger area extends for 0.2 to 1.5 miles off the west coast of San Clemente Island for 3.2 miles southward of West Cove; limits and regulations are given in **204.200a,** Chapter 2.

A measured nautical mile on course **330°** is 1.3 miles southward from West Cove. The 70-foot towers of the front and rear markers on San Clemente Island are more than 500 feet high.

Chart 5112.—Santa Catalina Island, 18 miles southward of Point Fermin, is 18.5 miles long in a southeasterly direction and has a greatest width of 7 miles. About 6 miles from the western end, a deep northerly cut almost divides the island. The cut forms coves less than 0.5 mile apart at their heads, an because the isthmus separating these coves is low, the island appears as two from a few miles off. Rugged and mountainous, the island has steep, precipitous shores intersected occasionally by deep gulches and valleys, and is covered with a thick growth and some scrub oak. The highest peak, 2,125 feet, is about in the middle of the eastern part of the island. Sheep and cattle are raised to some extent.

Much of the northern shore is free from kelp, but the southern side in general has a narrow fringe of kelp close to the beach. The island rises abruptly from deep water, the 30-fathom curve being close inshore. Most of the dangers in the approaches to the island are inside the kelp.

Lights are shown from white pyramidal structures on the south end, **Long Point** (east side), and **West End** (northwest point) of the island.

Ribbon Rock, on the west side of Santa Catalina Island, 2.9 miles southeastward of West End, shows as a dark vertical rock wall with a gigantic ribbon of quartz veining which is visible many miles.

Farnsworth Bank, 9.2 miles southeastward of West End and 1.6 miles offshore, has a least known depth of 8 fathoms over it.

Shelter from Santa Ana winds can be had by anchoring in the bight near the **Palisades** on the southern side of the island, 2 to 3 miles northwestward of the southern extremity.

There are two prominent rock quarries on the eastern side of the island; one is 1.5 miles southward of Avalon Bay, and the other is 1 mile southeastward of Isthmus Cove.

White Cove, 3.5 miles northwestward of Avalon, affords anchorage in 8 fathoms; the protection is similar to that at Avalon.

Chart 5128.—Avalon Bay is on the northern shore of Santa Catalina Island, 2.5 miles from its southeastern extremity. The small bay affords indifferent anchorage in 8 fathoms, sandy bottom. A depth of 20 fathoms is immediately outside the points of the cove. The shelter is good in southwesterly weather, and fair in northwesterly weather if the wind is not too strong. The anchorage is not safe during the Santa Ana winds that occasionally blow from the eastward during the fall and winter. See Appendix for **storm warning display.** A **special anchorage area** is in the bay; limits and regulations are given in **202.1** and **202.105,** Chapter 2.

Boundary lines of inland waters.—The line established for Avalon Bay is described in **82.161,** Chapter 2.

A large white circular building on **Casino Point,** on the north side of the bay, is brilliantly illuminated for about half the night. **The Carillon,** a white concrete tower, 0.2 mile southwesterly of the point, is illuminated and is easily identified.

A radiobeacon is operated from Casino Point and a fog signal, sounded only upon approach of regularly scheduled passenger vessels, is on the pump house near **Bathhouse Point,** on the south side of Avalon Bay.

Avalon, an extensive resort and the principal settlement on the island, has several wharves. Daily ship and air-

plane service is maintained with San Pedro. A road along the beach extends some distance on each side of the cove, and at night the lights along this road are conspicuous from San Pedro Channel. The cove is important as a yacht anchorage and as a vacation resort. The customary yachting and fishing-boat supplies are available.

There is an **anchorage area** in **Descanso Bay**, just northward of Casino Point; limits and regulations are given in **202.216**, Chapter 2.

A **seaplane restricted area** is at **Hamilton Beach**, 0.4 mile northward of Casino Point; limits and regulations are given in **207.620**, Chapter 2.

Isthmus Cove, on the north shore 6 miles from the western end of the island, affords shelter for small vessels in southerly weather, but is dangerous in northwesterly weather. A wharf extends out to a depth of 17 feet. Several prominent buildings are on shore. Isthmus Cove and Avalon are connected by a road, and during the tourist season launch service is maintained between the two points. An **anchorage area** is in the cove; limits and regulations are given in **202.216**, Chapter 2.

Boundary lines of inland waters.—The lines established for Isthmus Cove are described in **82.159**, Chapter 2.

The approach to Isthmus Cove alongshore from the eastward is clear, but westward of the cove entrance there is **Eagle Reef**, covered by 3 feet. The reef is marked by growing kelp and by a buoy about 100 yards to the eastward. In approaching from northward, **Ship Rock**, about 1 mile northward of the cove, is the guide. A light is shown from a white pyramidal structure on top of the rock. From the channel the rock looks like a black haystack; the top is mostly white due to bird droppings. A reef extends about 120 yards southward of Ship Rock, ending in a rock that uncovers 3 feet.

Bird Rock, 37 feet high and about 150 yards in length, is about 500 yards off the beach northward from the eastern part of the cove entrance. The rock is covered with sand and grass. In places reefs extend off the rock more than 100 yards, but it may be approached close-to on the eastern side.

Harbor Reefs, 400 yards southwestward of Bird Rock, are 350 yards long in a northwesterly direction, and less than 100 yards wide. They usually are well marked by kelp. A rock near the eastern end uncovers about 2 feet. There is a lighted buoy at the south end of the reef and a buoy westward of the western end.

Fisherman Cove, in the eastern part of Isthmus Cove, is small, but is said to be the only shelter against Santa Ana winds on the north shore of Santa Catalina Island. The cove is an overnight anchorage for large and small pleasure boats, which frequently fill it during the summer months.

Catalina Harbor, on the southern side of the isthmus separating it from Isthmus Cove, affords shelter for small vessels in all but southerly weather. This harbor is funnel-shaped, open to the southward, free from hidden dangers, and easy of access. Small and bare **Pin Rock**, close inside the eastern head of the harbor, is 150 yards offshore and has deep water around it. The anchorage is in 4 to 5 fathoms, soft bottom, abreast **Ballast Point**, the long low point on the eastern shore. The head of the harbor is shoal. The 3-fathom curve is marked by kelp, and vessels entering should give the shores a berth of 150 yards.

Chart 5101.—San Pedro Channel is 17 miles wide between the mainland, Point Fermin to Point Vicente, and Santa Catalina Island. Current observations have been made 7 miles south of San Pedro Breakwater. Two periodic currents occur at this location; a tidal current, and a daily current apparently due to a land and sea breeze. Both are rotary, turning clockwise, and each is weak, having a velocity of 0.2 knot. The tidal current is very complicated but the daily current is simple, maintaining on the average an approximately constant velocity and shifting direction to the right about 15° each hour. It sets north about 9 a.m., east at 3 p.m., south at 9 p.m., and west at 3 a.m.

Currents due to winds and oceanic drifts vary in velocity and direction. The average current for the period of observations sets 112° with a velocity of 0.1 knot. Currents greater than 1 knot occur infrequently. The greatest velocity during 5 months of observations was 1.5 knots.

Chart 5113.—San Nicolas Island, the outermost of the group off southern California, is 53 miles off the nearest point of the mainland, 43 miles west-northwestward of San Clemente Island, and 24 miles southwestward of Santa Barbara Island. The island is 8 miles long in an easterly direction, 3 miles wide, and 905 feet high at its highest point; it is visible about 38 miles. The island has a gently rounding profile from a distance. The western part is covered with sand, some of which has drifted to the middle northern shore. The remainder of the island is cut by deep arroyos and the top of the mesa is spotted with patches of burr clover and bunch grass. With the exception of the rocky points, the beaches are all sand. The island is practically surrounded by kelp. At the western end the kelp extends westward about 3 miles over very irregular bottom. Two reefs in the kelp extend 1.6 miles westward from the western extremity of the island. In thick weather great caution must be exercised in approaching from westward, and vessels should in no case pass inside the kelp. No dangers are known to exist outside the kelp.

An aero light, 981 feet above the water, is near the center of San Nicolas Island. Marine lights are shown from white pyramidal structures on the south, east, and north sides of the island. A lighted buoy is 1.3 miles southeastward of the easterly sandspit.

A **naval restricted area** extends 3 miles from the shoreline around the island; limits and regulations are given in **207.615**, Chapter 2.

Begg Rock, 15 feet high, is 8 miles northwestward of

the western point of San Nicholas Island. A reef extends northward and southward of the rock over 100 yards in each direction. The rock rises abruptly from depths of 50 fathoms. A lighted whistle buoy is 500 yards northward of the rock.

A bank covered 30 to 50 fathoms extends 7.8 miles eastward from the eastern point of San Nicolas. From the 50-fathom curve the depths increase rapidly to the eastward and southward.

Restricted anchorage areas are off the northwest, southwest, and southeast ends of San Nicolas Island; limits and regulations are given in **202.220,** Chapter 2. Upon approval of naval authorities, indifferent anchorage may be had on the southern side of the 0.6-mile long sandspit on the eastern end of the island. Small craft anchor in 8 fathoms, hard sand bottom, near the inshore edge of the kelp. Larger vessels anchor farther offshore in 10 to 17 fathoms, hard sand bottom. The anchorage is often uncomfortable as the island tends to split the westerly seas and they break with equal force on both sides and meet off the end of the spit in a maelstrom of breakers. This condition tends to move the sand from the western end of the island and builds up the sandspit. After sunset there is frequently a strong wind blowing off the mesa, making holding difficult. In a blow, local fishermen usually leave this anchorage, preferring the one at Santa Barbara Island. A landing can usually be made at the eastern end on the southern side of the island during the summer without difficulty.

Chart 5110.—Santa Barbara Island, 33 miles south-southwestward of Point Dume and 21 miles westward from the western end of Santa Catalina Island, is 1.5 miles long in a northerly direction, and has a greatest width of 1 mile. The profile of the island is saddle-shaped, and at a considerable distance it appears to be two islands. The greatest elevation is 635 feet on the southern side of the saddle, and the island is visible for over 25 miles in clear weather. The shores are bold and precipitous and well marked by kelp extending to about 10 fathoms at irregular distances from the shore. Westward of the island the kelp makes out more than a mile over very irregular bottom; a rock that breaks in moderate swell is 0.7 mile westward of the west point. The water around the island is deep except where the kelp indicates foul or rocky bottom. A light is shown from a white pyramidal structure on the northeasterly point of the island.

Sutil Island, a rocky islet 300 feet high and surrounded by kelp, is 0.4 mile westward from the southern point of Santa Barbara Island; its northern face is steep. A smaller 145-foot-high rock islet is 200 yards offshore about 0.2 mile westward from the northern point of Santa Barbara Island.

A general anchorage area extends 2 miles off the east coast of the island; limits and regulations are given in **202.222,** Chapter 2. Inside this area a fair anchorage for small craft in the prevailing westerly weather may be had 700 yards southeastward of the northeastern point; large vessels can anchor within the 30-fathom curve with hard gray sand bottom.

Chart 5101.—Osborn Bank, 6.5 miles southward of Santa Barbara Island, is 5 miles long in a northwesterly direction and has an average width of a mile. The least depth found over it is 19 fathoms.

A submerged pinnacle rock of very small area covered by at least 17 fathoms is 16 miles north-northwestward of Santa Barbara Island.

Channel Islands National Monument.—Santa Barbara Island, Anacapa Island, and areas within one nautical mile of the shoreline of these islands, except for certain described parcels of land, have been reserved as Channel Islands National Monument, and are subject to rules and regulations prescribed by the Secretary of the Interior.

Chart 5114.—Anacapa Island, 11 miles southwestward of Point Hueneme, is the easternmost of the northern group of Channel Islands and consists of three islands separated by two very narrow openings which cannot be used as passages. The easterly opening is filled with rocks, is bare, and is crossed by a trestle walkway. The westerly opening is only 50 feet wide and is blocked by sand. **Anacapa Island Light (34°00.9′ N., 119°21.5′ W.),** 277 feet above the water, is shown from a white cylindrical tower on the east end of the island. A radiobeacon is 700 yards westward of the light and a fog signal is on the lower white square tower close eastward of the light.

From its eastern point the island extends 4.5 miles in a general westerly direction. The eastern and lowest island of the Anacapa group is 1 mile long, 0.2 mile wide, 250 feet high, and rather level on top. The middle one is 1.5 miles long, 0.2 mile wide, and 325 feet high. The western and largest island is 2 miles long, 0.6 mile wide, and rises to a 930-foot peak. The westernmost island is visible at a distance of 35 miles in clear weather, and the other two at 15 to 20 miles. The shores of Anacapa Island are perpendicular and filled with numerous caves. The eastern extremity terminates in 80-foot **Arch Rock,** with a 50-foot arch and a pyramidal rock just southward of its eastern end. The island is surrounded by kelp except in a few small places.

The light station attendants and several fishermen are the only persons on Anacapa Island. Seals and pelicans are present in large numbers. The cream-colored houses with tile roofs of the light station personnel are 300 to 400 yards westward of the light. A single large white building is 100 yards farther to the westward. There is a group of weatherbeaten shacks on the easternmost island about 100 yards from the pass which separates it from the middle island. They are visible only from the northward.

The best anchorage in southeasterly storms is on the northern side about 0.2 mile northward of the center of the middle island in depths of 9 to 12 fathoms. In northwesterly weather the best anchorage is 0.3 mile south-

ward of the eastern opening in depths of 8 to 12 fathoms. However, it is best for larger vessels to lie at Smugglers Cove, on the eastern side of Santa Cruz Island, where the bottom is not so steep-to. Small boats anchor in 5 to 7 fathoms in **East Fish Camp,** a bight about 0.4 mile southwestward of the eastern opening. About the only protection from northeasters is to anchor as close as possible in the bight immediately westward of **Cat Rock,** on the southern side of the western island. The Coast Guard maintains a boat landing and hoist on the northern side near the eastern extremity. Landings can also be made on either side of the island near the western opening and at East Fish Camp. In thick weather, vessels in the area should stay in 50 fathoms or more, because the island rises abruptly from deep water.

Anacapa Passage, between Anacapa and Santa Cruz Islands, is 4 miles wide and free of dangers. It is steep-to on the Anacapa Island side and has a gradual slope to the shore of Santa Cruz Island. The passage is seldom used, and should not be attempted in thick weather as soundings give no warning of a close approach to the islands. Tide rips are strong under certain conditions of wind and current, especially during southeast storms and northeasters.

Charts 5114, 5115.—Santa Cruz Island, 17 miles west-southwestward of Point Hueneme, is the largest of the Channel Islands. It is 21 miles long in a westerly direction and has an average width of 5 miles. The highest peak, in the western part of the island, rises to 2,434 feet, and in the eastern part the land attains an elevation of about 1,800 feet. The eastern part is very irregular, barren, and destitute of water; the western part has a few trees, is well covered with grass, and has several springs. Sheep and cattle are raised. The shores are high, steep, and rugged, with deep water close inshore, and there is considerably less kelp than around the other islands. The reefs, extending a mile offshore on the south coast at Gull Island, are the only outlying dangers.

San Pedro Point is the eastern extremity of the island. There is a small-boat landing in **Scorpion Anchorage,** a shallow bight 1.8 miles northwestward of San Pedro Point; it consists of a cribbed area with a float and gangway at the end of the roadway. Several large buildings are along the roadway. Large clumps of trees are near the houses.

Chinese Harbor, in the eastern part of the broad bight on the northern shore, 4.5 miles west of San Pedro Point, affords anchorage in the kelp in 5 to 6 fathoms. The northeastern part of the harbor is an excellent anchorage in southeasterly to southwesterly weather in 9 to 10 fathoms. Fresh water may be obtained about 0.8 mile eastward of the anchorage. This harbor affords the best shelter on the island from northeasterly winds.

Prisoners Harbor, in the western part of the bight on the northern shore 8 miles west of San Pedro Point, affords shelter from all winds except from northeastward to westward. Some protection from northwesterly weather is afforded by the kelp but a heavy swell rolls in. In northeasterly weather the anchorage is unprotected and dangerous. A wharf with 16 feet at its face is in the harbor. A large white house, with tile roof, and other buildings stand back of this wharf. The best anchorage is in 12 to 15 fathoms, sandy bottom, abreast a white rock on the western shore of the bight, and the outer end of the wharf in range with the buildings at the inner end. Fresh water can be obtained.

Pelican Bay, a small indentation in the northern shore of Santa Cruz Island 1 mile west-northwestward of Prisoners Harbor, is used as a yacht anchorage during the summer. In northwesterly weather small boats anchor close to the cliff which forms the western shore of the bay.

Painted Cave, 3 miles east of **West Point,** the northwestern extremity of the island, is a large cave into which small boats may be rowed for a considerable distance. The entrance is over 150 feet high. The inner end of the first chamber, 600 feet from the entrance, has depths of more than 2 fathoms.

Forney Cove, 1 mile eastward of **Fraser Point** at the western end of the island, affords shelter in northerly weather in 7 to 8 fathoms. The surf is heavy on the beach, but the rocky islet westward and the reef connecting it with the shore lessen the swell at the anchorage.

Gull Island, 65 feet high and about 0.2 mile in extent, is the largest and outermost of a group of small rocky islets, 0.7 mile southward of **Punta Arena,** on the southern side of Santa Cruz Island. Kelp surrounds Gull Island, and the bottom in the vicinity of the group is foul. A light is shown from a white pyramidal structure on the island.

Willows Anchorage, on the southern shore 3.6 miles eastward of Gull Island, can be used by small craft in northwesterly weather and affords a good boat landing.

Smugglers Cove, 1.2 miles southwestward of San Pedro Point, affords shelter in northwesterly weather in 5 fathoms, sandy bottom. Water may be obtained from wells on shore.

Santa Cruz Channel, between Santa Cruz and Santa Rosa Islands, is 5 miles wide, with good water close to both islands. The rocks off the western and southwestern points of Santa Cruz Island and the eastern and northeastern points of Santa Rosa Island are so close inshore that they cannot be considered as dangers in the channel.

Charts 5115, 5116.—Santa Rosa Island, 24.5 miles southwestward of Goleta Point on the mainland, is 15 miles long in a westerly direction and has a greatest width of nearly 10 miles. The highest point, near the middle of the island, is 1,589 feet in elevation and visible over 40 miles. The island has some water and is partially covered with vegetation, but there are no large trees. The shores are bold, high, and rocky; kelp surrounds the greater part of the island. Depths in the approaches to the island shoal more abruptly from southward than from northward, where the 100-fathom curve is over 5 miles and the 20-fathom curve about 2 miles from the beach.

There are no harbors, but anchorage may be made in Bechers Bay and Johnsons Lee. There are several good boat landings.

East Point, the eastern extremity of Santa Rosa Island, is moderately high, sharp, and bold. A rock covered 2¾ fathoms is in the kelp 0.7 mile northward from the point, and a shoal covered 3½ fathoms is 2 miles northward of the point.

Skunk Point, 2.5 miles northward of East Point, is formed of drifts of sand; it is difficult to see on dark nights. There are sand beaches westward and southward, and the sand dunes behind the point are 250 feet high. Care should be taken to avoid the sandspit off the point where the sea breaks heavily in bad weather. The current is sometimes strong in the vicinity of the point.

Bechers Bay, a broad semicircular bight on the northeastern side of Santa Rosa Island, is 4.5 miles wide between Skunk and Carrington Points and 1.5 miles in depth. **Southeast Anchorage,** 1.3 miles westward of Skunk Point, affords protection in southeasterly weather in about 6 fathoms, sandy bottom. **Northwest Anchorage,** in the western part of the bight and 1.5 miles southward from Carrington Point, affords fair shelter in northwesterly weather. A wharf at the anchorage has 16 feet at its outer end. The best anchorage is in 6 to 7 fathoms off the end of the wharf.

Carrington Point, the northern point of the island, has a seaward face 0.8 mile in length. It is bold and rocky, and rises rapidly to an elevation of 440 feet.

Foul ground extends about 0.3 mile northward from Carrington Point and terminates in **Beacon Reef,** which covers 2¼ fathoms. The reef rarely breaks, and there is no safe passage behind it.

Brockway Point, high, bold, and rounding, is about midway along the northern shore of Santa Rosa Island. **Rodes Reef,** marked by kelp, is a patch of three sunken rocks 1.2 miles east-northeastward from Brockway Point and 0.8 mile offshore. It breaks in nearly all weather.

Sandy Point, the western extremity of the island, is moderately bold and rocky, with a detached rock lying close inshore and sand dunes 400 feet high extending inland. These white dunes are prominent when approaching from southward or westward. Shallow water extends off the point. During the general northwesterly weather, swells form at a considerable distance from the shore. The swell also reaches the point from a southwesterly direction.

An anchorage on the southern side of Sandy Point affords shelter from northerly and northwesterly winds to small vessels, but local knowledge is necessary to avoid outlying rocks.

Talcott Shoal, covered 1¾ fathoms, is on the edge of the kelp 1.5 miles north-northeastward from Sandy Point. Depths surrounding the shoal range from 4 to 12 fathoms. The shoal breaks only in heavy weather. In calm weather there is little indication of the shoal as the kelp is light and there is very little lumping of the water. A detached kelp patch is 1 mile northward of the shoal.

Bee Rock, 0.8 mile offshore 3.6 miles southeastward of Sandy Point, is 5 feet high, but is not easily seen. It is surrounded by kelp that stretches from South Point to Sandy Point. A smaller rock, 10 feet high, is about 100 yards southeastward of the rock. In ordinary weather there is a lumping of the water with an occasional break on the rock, covered 2 fathoms, 0.3 mile northwestward of Bee Rock. Another rock, covered 1¼ fathoms, is close southward of Bee Rock. Several other rocks and shoals exist inside the kelp. Vessels should not go inside the kelp in this area.

South Point, the southern point of Santa Rosa Island, terminates in a rocky bluff 100 feet high, and rises rapidly to a height of 460 feet, then to 603 feet. Cliffs, several hundred feet high and about 0.5 mile in extent, comprise the southwestern face of the point. A light is shown from a small white house on the point.

Johnsons Lee, an open roadstead immediately eastward of South Point, affords fair shelter from westerly and northwesterly winds but is dangerous in southerly weather. The Coast Guard makes landings on the west shore of Johnsons Lee with supplies for South Point Light.

San Miguel Passage, between Santa Rosa and San Miguel Islands, is 2.5 miles wide between the ledges which project from Sandy Point and Cardwell Point, the opposite points of the two islands. There is much broken water, with many current rips near these ledges. To avoid Talcott Shoal, vessels making the passage from the southwestward should not allow the outer rock off the western point of Santa Rosa Island to bear westward of south until clear of the shoal. Sailing vessels should avoid this passage as the light airs and calms under the lee of San Miguel Island and the currents frequently combine to set a vessel toward Talcott Shoal.

Chart 5116.—San Miguel Island, 23 miles south by east of Point Conception, is the westernmost of the Channel Islands and the most dangerous to approach. The island is irregular in shape and 7.6 miles long in a westerly direction, with an average width of 2 miles; the highest points, 831 and 822 feet, are near the middle of the island and are visible about 35 miles. The island is covered with grass, but there are no trees. The western part has more sand dunes on it than any of the other islands in the group. The shores are bold, broken, and rocky, with a few short stretches of beach, the southern shore being more precipitous than the northern. Several anchorages and boat landings are available along the northern and southern shores.

Prior approval of the Commandant, Eleventh Naval District, San Diego, or his authorized representative, is required to enter San Miguel Island.

Cardwell Point, the eastern extremity of the island, terminates in a low sandy point extending 0.5 mile eastward of a cliff 40 feet high. A dangerous reef extends 0.4 mile eastward of the point, and foul ground extends 0.8 mile north-northwestward. In 1962, shoaling was reported up to a mile eastward of the point. A sunken rock and a rock awash are about 400 yards southward of the middle of the sandy point. During prevailing weather breakers off this point are caused by the meeting of the seas.

Prince Island, 288 feet high, is 2.6 miles northwestward of Cardwell Point and 0.4 mile off the eastern head of Cuyler Harbor. The island is dark in color and rocky, with a precipitous seaward face.

Cuyler Harbor is a bight 1.2 miles long and 0.6 mile wide on the northen shore southwestward of Prince Island. The anchorage is in the western part of the harbor; the eastern part is foul. Good shelter may be had in southerly weather, but the holding ground is poor. In strong northwesterly weather the heavy swells that sweep around the northern shore and into the harbor make the anchorage dangerous. The harbor is not safe in rare northerly or easterly winds. Water may be obtained at a small spring abreast the anchorage. Prince Island and Harris Point are prominent in the approaches.

Middle Rock, 0.5 mile west-southwestward of Prince Island, uncovers about 4 feet; foul ground surrounds the rock for a distance of 100 yards. **Can Rock,** 4 feet high, is 0.3 mile southwestward of Prince Island; there is foul ground between the rock and the southern shore of the harbor. Kelp grows all over the bight.

To enter Cuyler Harbor, bring Harris Point to bear 261°, distant 1.7 miles, and the western point of Prince Island to bear 186°, distant 1.3 miles; thence steer **209°**, heading midway between Middle Rock and the western point at the entrance, and when the southern point of Prince Island bears midway between Middle and Can Rocks, anchor in 5 to 8 fathoms. The course heads for **Judge Rock,** small and black, near the western end of the sand beach. The western point at the entrance off **Bat Rock** should be given a berth of about 0.3 mile to avoid the shoal extending eastward for over 300 yards. If desired, anchorage may be made about 0.1 mile farther westward, where better protection is afforded in northwesterly weather. The passage between Prince Island and the eastern head should be attempted only by small craft.

Harris Point, the northern extremity of the island, is bold and precipitous, rising to a hill, 485 feet high, 1 mile southward of the point. There are no outlying dangers, and the water is deep close-to.

Wilson Rock, 2.2 miles northwest of Harris Point, is 19 feet high and black. A reef, extending about 1 mile west-northwestward from the rock, uncovers in two places; foul ground is a short distance northward of the reef. It breaks in any light swell from the northwestward. There is foul ground southward and southwestward of the rock. The covered rock 0.3 mile southward of Wilson Rock breaks. This locality should not be approached in thick weather, as the dangers rise abruptly from deep water and are not marked by kelp; soundings give no positive warning of their proximity.

Simonton Cove, on the northwestern side of San Miguel Island, is a very shallow bight 2.4 miles wide and 0.6 mile in breadth. This cove has considerable kelp and a few covered rocks. There are several fresh-water springs in the bluffs just above high water. From the southwestern head of Simonton Cove, foul ground extends northwestward for nearly 1 mile.

Castle Rock, 180 feet high, is a three-headed islet 1.6 miles north-northeastward from Point Bennett, in the middle of the kelp field, and 0.5 mile offshore. A shoal spot 0.5 mile westward of the rock is near the edge of the kelp.

Westcott Shoal, covered 4¾ fathoms, is 0.8 mile northward from Castle Rock. A 2¾-fathom spot near an oil spring is about 0.6 mile northward from the shoal.

Point Bennett, the western point of the island, is a long, narrow, jagged bluff, 74 feet high, rising rapidly to 337 feet. High sand dunes extend from the point for 2 miles. There are two rocky islets south of and close under the point, and foul ground extends about 0.5 mile westward and 1 mile northward of the point but inside the limit of the kelp. A lighted whistle buoy is about 0.8 mile southwestward of the point.

Caution.—Navigation in this area should not be attempted without local information.

Richardson Rock, 5.5 miles northwestward from Point Bennett, is 53 feet high, white-topped, and small in area. Two smaller and lower rocks are close-to on the eastern side. Richardson Rock rises abruptly from deep water, 30 to 40 fathoms being found within 0.3 mile. The rock is prominent in clear weather, but in thick weather the locality should be avoided, as soundings give no warning of a near approach. A lighted whistle buoy is about 0.5 mile northwestward of the rock.

Anchorage for small craft may be had at **Adams Cove,** immediately eastward of Point Bennett, and at several places along the southern shore of San Miguel Island, but local knowledge is necessary.

Tyler Bight, on the southern shore 1.8 miles eastward of Point Bennett, affords shelter for small craft in northwesterly weather. Anchor in 7 fathoms, sand bottom, at the northwestern part of the bight under the high bluff, with **Judith Rock,** at the western entrance of the bight, bearing 265°, 500 yards distant; kelp extends southward and eastward of the point. In moderate northwesterly weather, the winds may attain velocities up to 45 knots 0.5 mile offshore; the sea in the bight, however, is quite smooth.

Wyckoff Ledge, 1.4 miles westward from Crook Point and 0.5 mile offshore, is covered 1½ fathoms.

Crook Point, the southern point of the island, is low and irregular. A boat landing may be made on the southern shore of the island in a small cove immediately westward of the point, but there is no anchorage.

Chart 5202.—Santa Barbara Channel is 63 miles long and increases gradually in width from 11 miles at the eastern end to 23 miles at the western end. The channel is free of dangers and has depths of 40 to more than 300 fathoms along the recommended track from San Diego and Los Angeles to northern ports.

On the northern side of Santa Barbara Channel is the mainland between Point Hueneme and Point Conception. On the southern side is the northern group of the Channel Islands—Anacapa, Santa Cruz, Santa Rosa, and San Miguel—which break the force of the heavy westerly

Pacific swell and afford a lee in winter from the full force of the southeasterly gales.

The eastern entrance to Santa Barbara Channel has a clear width of 2 miles between the 100-fathom curves, and lies between Anacapa Island and Point Hueneme. On the northern side of this entrance is deep **Hueneme Canyon,** which extends from Point Hueneme in a south-southwesterly direction across the channel. The western entrance to the channel has a clear width of 10 miles between the 100-fathom curves, and lies between Richardson Rock and Point Conception.

Weather.—The prevailing winds are westerly and blow nearly every day, especially in the afternoon. Southeasterly storms occur in the winter, and at times the sea is too rough for several days to permit the passage of small vessels.

In the summer the winds in the channel are wholly different from those outside the islands and off the coast to the northwestward. Under the northern shore, which is protected by the bold range of the Santa Ynez Mountains, the westerly winds do not reach far eastward of Point Conception with much strength but are felt towards the islands, a strong northwesterly wind and heavy swell coming in from the open ocean. The climate in the Santa Barbara Channel, because of this blocking of the winds, is much milder than to the northward along the coast. However, during northwesterly weather boats crossing the channel from the mainland usually encounter heavier seas as the islands are approached. The belt of rough seas, locally known as **Windy Lane,** lies along the north shores of the islands and is about 6 miles wide. This sea condition is the opposite to that experienced in the crossing from Los Angeles-Long Beach to Santa Catalina Island. Strangers are cautioned that good seamanship sometimes calls for returning to the mainland rather than attempting Windy Lane when rough seas are encountered. These westerly winds usually begin about 10 a.m. and grow progressively stronger until sundown.

During heavy northwesterly weather strong squally winds draw down the canyons between Point Conception and Capitan and pass directly offshore, causing a severe choppy sea. Heavy northwesterly gales are often encountered off Point Conception on coming through Santa Barbara Channel, and great changes of climatic and meteorological conditions are experienced, the transition often being remarkably sudden and well defined.

In the fall and winter, stiff northeasters are occasionally experienced at and near the eastern end of the channel. They come up without warning, usually at night in clear dry weather, and when the barometer is either high or rising rapidly. At such times small boats should be prepared to seek shelter at a moment's notice.

During the summer heavy fogs are are a common occurrence in the Santa Barbara Channel and envelop the main shore, channel, and islands. Sometimes the mainland and channel are clear while the islands alone are hidden. At other times all are clear during the day, but wrapped in dense wet fog at night. This condition, the fog lying offshore during the day and enveloping the land at night, is characteristic of the whole southern California coast. The fogs occur mostly during calm weather and light winds, and are generally dissipated by the strong northwesterly winds.

Currents in Santa Barbara Channel are variable, depending to a great extent upon the wind. It appears that a weak nontidal flow sets eastward in the spring and summer, and westward in autumn and winter.

It has been observed that a strong inshore set prevails on a rising tide in the deep waters of Hueneme Canyon. In general, there are conflicting currents, at times quite strong, around the slopes of the submarine valleys both here and off Point Mugu.

The tidal current sets along the northern shore of Santa Barbara Channel with velocities of 0.5 to 1 knot. In heavy northwesterly weather, the current and heavy swells make into the southern side of the western entrance to the channel and along the northern shore of San Miguel Island.

The currents in the vicinity of the Channel Islands frequently follow the direction of the wind, with eddies under the lee of the islands and projecting points. Tidal currents of about 1 knot set through the passages between the islands.

6. POINT ARGUELLO TO SAN FRANCISCO BAY, CALIFORNIA

Chart 5302.—From Point Arguello to Point Sal, the coast trends northward for 19.5 miles in two shallow bights, separated by Purisima Point. From Point Sal the coast continues northward for 14 miles, then bends sharply westward for 6 miles to Point San Luis, forming San Luis Obispo Bay. Soundings are useful along this stretch of the coast, and between Point Arguello and Point San Luis the 20-fathom curve can be followed with safety in thick weather. In clear weather the headlands and other natural features can be easily recognized.

Danger and restricted areas extend 3.5 miles offshore from south of Point Arguello to Point Sal; limits and regulations are given in **204.202,** Chapter 2.

Point Pedernales, 1.5 miles north of Point Arguello, and the largest of the numerous rocks as much as 300 yards offshore, are very dark and conspicuous alongside the sand dunes immediately northward of the point.

La Honda Canyon, 2 miles northward of Point Arguello, is a deep gulch crossed by a railroad trestle easily distinguished when abreast the mouth. From here the coast to Purisima Point consists of a low tableland and sand dunes that contrast strongly with the dark cliffs southward.

Surf, 7 miles northward of Point Arguello, is a station along the railroad. The yellow station house is conspicuous.

Purisima Point, 10.6 miles northward of Point Arguello, is low and rocky, with reefs extending southeastward for 0.3 mile. The northern side of the point is bare sand. It has been reported that an inshore set is experienced off the coast in the vicinity of the point. From Purisima Point to Point Sal, the coast is sandy and lower than that southward

Point Sal, 19.5 miles north of Point Arguello, is a bold dark headland marked by stretches of yellow sandstone. From northwestward the headland looks like a low conical hill with two higher conical hills immediately behind it. It rises gradually to a ridge 1,640 feet high, 3 miles to the eastward. From southward the hills are not so well defined. **Lion (Seal) Rock,** 54 feet high, is a rocky islet 200 yards off the south face of Point Sal. A small rock is close to the point. Breakers and reefs extend nearly 600 yards southward and westward from Point Sal and 200 yards southwestward of Lion Rock.

Anchorage under Point Sal affords some protection from northwesterly winds in 7 to 9 fathoms, sandy bottom, but is subject to swell. Shoal water extends nearly 0.5 mile westward from the southeastern point of the anchorage. The best anchorage is in 7 fathoms, 500 yards 303° from Lion Rock and with the northern end of the rock just open of the extremity of Point Sal.

From Point Sal northward the coast is a sand beach backed by low dunes for 14 miles, and then changes to bold rocky cliffs that curve sharply westward to Point San Luis and form the northern shore of San Luis Obispo Bay.

Oceano is a small resort 12 miles northward of Point Sal. The county airport is located here.

Pismo Beach is a resort 6 miles eastward of Point San Luis. The pleasure wharf is 1,200 feet long and has 12 feet at the outer end. There are no facilities for landing at the wharf. The place is noted for its clams. **Shell Beach** is a small residental settlement 1.5 miles northwestward of Pismo Beach. Two aero lights, one 4 miles northeast and the other 2.5 miles southeast of the city of San Luis Obispo, are visible from seaward.

Chart 5386.—San Luis Obispo Bay, 35 miles north of Point Arguello, is a broad bight which affords good shelter in northerly or westerly weather. Southeasterly gales occur two or three times during the winter. The eastern shore is a narrow tableland that ends in cliffs 40 feet high. The northern shore has irregular cliffs 40 to 100 feet high to within 0.5 mile of **San Luis Obispo Creek** where a sand beach fronts **Avila Beach.** Westward of the creek, the shore is high, with rocky bluffs extending to **Point San Luis.**

Port San Luis, on the western shore of the bay, is the principal seaport for San Luis Obispo which is 10 miles inland. The port is primarily an oil-loading terminal, but is also used as a base for commercial fishing boats, sport-fishing boats, and recreational craft.

San Luis Obispo Light (35°09.6′ N., 120°45.6′ W.), 130 feet above the water, is shown from a 40-foot white square tower on a dwelling on Point San Luis; a radiobeacon and fog signal are at the station. **San Luis Hill,** 0.5 mile northwestward of the light, is prominent from southward.

Boundary lines of inland waters.—The line established for San Luis Obispo Bay is described in **82.143,** Chapter 2.

Depths of 21 to 31 feet are available to the anchorage and wharves in the bay, but there are several shoal spots covered 11 to 18 feet that must be avoided.

Large vessels can anchor between the two long piers in the western part of the bay according to draft. This anchorage is exposed in southerly or southeasterly weather causing heavy swells.

A good anchorage for small vessels is about 0.2 mile southward of Port San Luis Wharf in 18 to 24 feet, muddy bottom. A **special small-craft anchorage** is easterly of County Wharf; limits and regulations are given in **202.1** and **202.120,** Chapter 2.

The dangers off the entrance to San Luis Obispo Bay are buoyed; the eastern part of the bay is foul. **Souza Rock,** 2.1 miles southeastward of San Luis Obispo Light, is covered 16 feet and rises abruptly from 19 fathoms. **Westdahl Rock,** 1.3 miles southwestward of the light, is covered 18 feet and rises abruptly from 10 fathoms. **Howell Rock,** 1.6 miles east of the light, is covered 13 feet. **Lansing Rock** covered 18 feet and **Atlas Rock** covered 13 feet are 0.7 and 0.5 mile eastward of the light.

An 800-yard breakwater, extending southeastward from Point San Luis through **Whaler Island** to a ledge partly bare at low water, provides some protection to vessels at anchor or at the wharves. Several small fishermen houses are on **Smith Island,** 0.2 mile northward of Whaler Island.

Storm warning displays are made; see Appendix.

San Luis Obispo Bay may be entered from southward by passing 100 yards westward of the lighted gong buoy marking Souza Rock, thence a **000°** course for about 2 miles until past Lansing Rock, and thence to anchorage or to the wharves. From northward stay outside of the lighted bell buoy marking Westdahl Rock and the lighted whistle buoy off Point San Luis breakwater, then head into the bay as previously mentioned.

Port San Luis is a customs port of entry. The deputy collector of Customs and the Immigration offices are at San Luis Obispo.

Port San Luis Wharf, 0.7 mile northward of Point San Luis, is privately owned and has a warehouse on the outer end. It is used by commercial and sport fishermen, and small cargo vessels. The berthing space opposite the warehouse has 28 feet alongside.

Pier 2 (Middle Dock), a mile northeastward of Point San Luis, is maintained by the Union Oil Company of California. The pier has 31 feet along both sides; a rocky patch covered 17 feet is 200 yards inshore from the west outer end of the pier. A light and a fog signal are privately operated on the outer end of the pier when ships are expected; the pier is lighted throughout its length when ships are being loaded. It is not safe to moor alongside in strong northerly weather; vessels usually leave the pier on the approach of a storm and anchor until it moderates. Mooring buoys are used to keep vessels clear of the pier, and a tug is available for handling lines to the buoys.

County Wharf, 1.4 miles northeastward of Point San Luis, is used by fishing and pleasure boats. The pier has 25 feet at the outer end and is lighted all night.

Fuel, oil, water, and some groceries are available. Small boats can be hoisted onto Port San Luis Wharf. A launching hoist is also at the end of County Wharf.

Transportion is by automobile to San Luis Obispo where rail, bus, and air connections can be made.

Chart 5387.—From Point San Luis to Point Buchon, the coast trends northwestward for 9 miles and consists of cliffs 40 to 60 feet high. The land rises rapidly from the cliffs to Mount Buchon. There are numerous outlying rocks and sunken ledges that extend more than a mile from the shore in some places.

Mount Buchon, a rugged mountain mass between San Luis Obispo Bay, Estero Bay, and the valley of San Luis Obispo, is prominent from either northward or southward. **Saddle Peak,** 4.1 miles north-northwest of San Luis Obispo Light, is visible for over 40 miles.

Santa Rosa Reef, 1.4 miles westward from San Luis Obispo Light, is covered 2¾ fathoms and rises abruptly from 13 fathoms. **Lone Black Rock,** 2 feet high and of small extent, is 0.5 mile westward from the light and 0.2 mile offshore.

Pecho Rock, 40 feet high, is 3 miles west-northwest from the light and 0.5 mile offshore. A smaller rock, 2 feet high, is 0.3 mile eastward from it. Foul ground, marked by kelp, is between the rocks and the shore.

A sharp prominent dark gray rock, 111 feet high, is 2.9 miles northwestward of Pecho Rock and 0.1 mile offshore.

Lion Rock, 2.6 miles southeastward of Point Buchon and 0.2 mile offshore, is 240 yards long in a northwesterly direction and 136 feet high. A high rock lies between it and the shore, and a small low rock is 200 yards westward.

Point Buchon ends in an overhanging cliff 40 feet high, with a low tableland behind that rises rapidly to a bare hill a mile to the eastward. There are a few detached rocks close under the cliffs. A lighted whistle buoy is 1 mile southwestward of the point and about 400 yards westward of a rock covered 3¾ fathoms.

Estero Bay is formed by a curve in the coast between Point Buchon and **Point Estero,** 13.5 miles northwestward. The shore of the bay follows a general northerly direction from Point Buchon for 11 miles, and then turns sharply westward for 5 miles to Point Estero. The northern part of Estero Bay is fringed with covered rocks and scattered kelp. The seaward faces of Cayucos Point and Point Estero are cliffs 50 to 90 feet high.

The coast drops abruptly from bold Mount Buchon to a sandy spit bordering Morro Bay and then rises to a bluff-bordered treeless country of rolling hills.

Morro Bay, about midway between Point Buchon and Point Estero, is a shallow lagoon separated from Estero Bay by a narrow strip of sand beach. The port facilities at the town of **Morro Bay,** a mile inside the entrance, are used by commercial fishing and sport-fishing boats, and recreational craft.

Morro Rock, on the north side of the entrance to Morro Bay, is a prominent cone with a light and fog signal on the south side. The outer half of the 600-yard breakwater extending southward from the rock is submerged at high water, but in 1962, it was being rebuilt with rock blasted off the seaward side of Morro Rock.

The 450-foot-high power plant stacks usually floodlighted at night, 0.5 mile eastward of Morro Rock, have been reported visible for 30 miles. **Hollister Peak,** 4.2 miles east-southeastward of Morro Rock, is the most prominent of a row of peaks behind Morro Bay, because of its jagged outline.

Boundary lines of inland waters.—The lines established for Estero-Morro Bay are described in **82.141,** Chapter 2.

The entrance to Morro Bay is through a buoyed channel between a 350-yard opening in the protective breakwaters. The controlling depth is about 11 feet to the piers at the town of Morro Bay, although in 1962, shoaling on the easterly side of the entrance channel was reported. Depths of 5 to 12 feet are available to the boat basin 2.7 miles above the entrance.

Special anchorage areas for small craft are in Morro Bay, 1 and 2 miles above the entrance, in 2 to 20 feet; limits and regulations are given in **202.1** and **202.125,** Chapter 2.

Currents in the entrance channel and around the breakwaters are strong at times. It is advisable to approach the entrance from southwestward because of the currents and sea conditions. Sharp turns should be avoided in the vicinity of the breakwaters, especially in heavy weather.

See Appendix for **storm warning display.**

County Wharf, on the north side of the harbor at the town of Morro Bay, has 20 feet alongside. A Coast Guard rescue vessel is stationed at the wharf. A fish pier with 16 feet alongside and several small landings are abreast the town. A boat works has facilities for hoisting craft up to 40 tons.

Gasoline, diesel oil, lubricants, water, ice, marine hardware, and groceries are available in the port.

For 3 miles northward of Morro Rock, submerged pipelines extend to oil-loading terminals up to 0.8 mile offshore in Estero Bay; the outer limits are marked by buoys. Loading ships lie head-to in the direction of the prevailing northwesterly wind. Adequate lines for offshore breast moorings are absolutely essential to prevent damage to the vessel and terminal equipment in case of a southerly wind. A mooring master supervises the mooring of vessels.

A rock covered 5¼ fathoms, 1.3 miles northwestward of Morro Rock, is marked by a buoy.

Cayucos, 11.5 miles northward of Point Buchon and in the northeastern part of Estero Bay, has a wharf used by small fishing boats; a depth of 12 feet is at the outer end. A general store has a limited amount of groceries.

Anchorage with fair shelter from the northward and northwestward may be had in 11 fathoms, sandy bottom, with the prominent white concrete tank on a hill westward of Cayucos bearing 017°.

Mouse Rock, 0.7 mile westerly of Cayucos, is covered ½ fathom and breaks heavily in all but smooth weather; it is marked by a bell buoy.

Cayucos Point, 2 miles westerly of Cayucos, is a low rocky promontory. **Constantine Rock,** 0.5 mile south of the point, is covered 1¼ fathoms and breaks heavily in a moderate swell; it is marked on the southerly side by a buoy.

Chart 5302.—From Point Estero northward for 8 miles to the village of Cambria, the bluffs increase in height, and the range of grassy hills is close to shore. The shore is well fringed with kelp; several rocks are close inshore. **White Rock,** 6 miles northwestward of Point Estero, is the most prominent. A pinnacle rock, 0.7 mile southwest of White Rock, is covered 5½ fathoms.

Von Helm Rock, 7.2 miles northwestward of Point Estero and nearly a mile offshore, is covered 2½ fathoms. The rock is very sharp and breaks only in the roughest weather; it is marked by a lighted gong buoy.

Cambria is about 1 mile inland in a grove of pine trees. Some of the streets and buildings are visible from seaward. No landing or anchorage is recommended.

From Cambria for 6.5 miles to San Simeon, rocks continue close inshore but the bluffs decrease in height and the hills recede from the shoreline. Thick groves of pine trees scatter the hillsides. Of the several rocks offshore, **Cambria Rock,** 10 feet high, and **Pico Rock,** 12 feet high, are the largest, but they are not prominent from seaward. Shoal patches up to 360 yards surround Cambria Rock and there is foul ground northwestward and southward of Pico Rock. A shoal, 580 yards southwesterly from Pico Rock, is covered 3¾ fathoms.

San Simeon Bay, 14 miles northwestward of Point Estero, is formed by the shoreline curving sharply to the westward, and on the western side by **San Simeon Point,** a low wooded projection extending southeastward. The trees show well from westward, but from southward the warehouses and buildings in San Simeon are more prominent. From westward the point itself is not easily recognized by those not familiar with it.

A lighted bell buoy, 0.4 mile southeast of the point, marks the entrance to San Simeon Bay. The bay offers good shelter in northerly weather but is exposed to southerly gales in winter. The best anchorage is in the middle of the bight in 5 to 8 fathoms, hard sand bottom.

San Simeon, eastward of San Simeon Point, is a small town with a general store where some groceries may be obtained. A 500-foot sport fishing pier is 1.7 miles east-southeastward of the point. Prominent **Hearst Castle,** 2.7 miles northeastward of San Simeon, is the former palace of the late William Randolph Hearst: it is now a State Historical Monument. The structure is lighted at night.

The coast from San Simeon Point for 5 miles to Point Piedras Blancas, is low, with numerous detached rocks lying in some cases over 0.5 mile offshore and usually well marked by kelp.

Point Piedras Blancas is a low rocky point projecting about 0.5 mile from the general trend of the coast. **Piedras Blancas Light (35°39.9′ N., 121°17.1′ W.),** 142 feet above the water, is shown from a 74-foot white conical tower with flat top on the point; a fog signal is at the station.

Piedras Blancas are two large white rocks, 74 and 31 feet high, 500 yards offshore and about 0.8 mile eastward of the point. From the southward they look like one rock.

Outer Islet, a large and prominent white rock 110 feet high, is close westward of the point. In hazy weather this rock is sometimes visible from the northwestward and southward when the light cannot be seen.

Anchorage for a small vessel, with protection, from northwesterly winds, may be had under Point Piedras

Blancas in 4 to 5 fathoms, sandy bottom, with the light about 0.2 mile bearing 280°.

A bank covered 11 fathoms, 3 miles west-northwestward from Piedras Blancas Light, has been reported breaking in a heavy westerly swell.

From Point Piedras Blancas for 8.6 miles to the mouth of the San Carpoforo Valley, the coast is low, with small bluffs and rolling treeless hills. Numerous rocks, fringed with kelp, extend well offshore. **Harlech Castle Rock,** 0.7 mile offshore 1.5 miles northwestward from Piedras Blancas Light, is the outermost and uncovers 1 foot; it is not usually marked by kelp. A shoal covered 2¾ fathoms, 0.5 mile northwestward of this rock, is surrounded by 10 to 12 fathoms.

La Cruz Rock, 48 feet high and fairly prominent, is 3 miles north-northwestward of Piedras Blancas Light and just southward of Point Sierra Nevada. A sandy beach inshore from the rock is a fair landing place in heavy northwesterly weather. This stretch of beach is free from breakers. There is a suitable anchorage for small boats east of the northerly limits of the rock in heavy northwesterly or light southerly weather.

Point Sierra Nevada, a low inconspicuous bluff, is named for the steamship SIERRA NEVADA which stranded on the rocks 400 yards northwestward of the point.

About 1.8 miles northward of Point Sierra Nevada is a group of isolated buildings inland from **Breaker Point;** the point is not prominent nor easily identified.

Ragged Point, 6 miles northward of Point Piedras Blancas, is a low projection readily identified, being the first point southward of prominent San Carpoforo Valley; visible rocks and ledges extend about 0.3 mile westward of the point.

From Ragged Point northward for 41 miles to the Big Sur River, the coast is very bold and rugged. The cliffs are 200 to 500 feet high and the land rises rapidly to elevations of 2,500 to 5,000 feet within 2 to 3 miles from the coast. There are few beaches and few outlying rocks. The highway along the coast is plainly visbile from seaward.

Two conspicuous landmarks lie between Ragged Point and Cape San Martin. **White Rock No. 1,** 39 feet high and rather sharp, is 0.5 mile offshore and 3.8 miles northwestward of Ragged Point; about 200 yards west of White Rock No. 1 is a rock awash. **White Rock No. 2,** 64 feet high and with a rounded top, is 0.2 mile offshore and 4.5 miles southeastward of Cape San Martin.

Salmon Cone, 500 feet high, is a rocky butte close to the shore and 0.5 mile northward of White Rock No. 1. The cone is not conspicuous as it blends into the background.

Several deep narrow gulches indent the coast between Salmon Cone and Cape San Martin. Two of the most prominent, **Villa Creek** and **Alder Creek,** are crossed by conspicuous white bridges.

A pinnacle rock, covered 1¾ fathoms, is 1.7 miles southeastward of Cape San Martin and 0.5 mile offshore.

Whaleboat Rock, which uncovers 5 feet, and **Bird Rock,** 5 feet high, are about a mile southeastward of Cape San Martin; they are conspicuous only when close inshore. A white barn is prominent in a group of buildings on the bluff just northward of these rocks.

Cape San Martin, 16 miles northwestward of Point Piedras Blancas, has a ragged precipitous seaward face and is readily identified by the **San Martin Rocks.** From southward, the inner rock, which is 100 yards offshore, is the most prominent, being 144 feet high and white in appearance. The middle rock is 34 feet high and triangular. The outer rock is cone-shaped, 44 feet high, and 0.5 mile offshore. A light is shown from a white structure near the western extremity of Cape San Martin. The structure is not conspicuous.

Willow Creek bridge, 0.3 mile northward of the light, is prominent from westward.

From Cape San Martin for 10 miles to Lopez Point, the coast forms an open bight with rugged shores intersected occasionally by deep narrow valleys. There are a few detached rocks but, with two exceptions, they do not extend far from the shoreline.

Plaskett Rock is a large prominent white rock, 110 feet high, 2 miles northward of Cape San Martin and 0.3 mile offshore.

Tide Rock, 4 miles northward of Cape San Martin and 0.7 mile offshore, is awash and quite sharp; it is a menace in smooth weather as there is no breaker to indicate its position.

Lopez Point, 9.5 miles northwestward of Cape San Martin, is a narrow tableland, 100 feet high, projecting a short distance from the highland. **Lopez Rock,** 51 feet high, is 0.3 mile offshore and 0.8 mile northwestward of Lopez Point. A shoal covered 6 fathoms is 0.3 mile southwestward of Lopez Rock.

An open anchorage affording some protection from northwesterly weather may be had about 1 mile southeastward of Lopez Point in 10 fathoms, sandy bottom. Smaller vessels may obtain better shelter by anchoring inside the kelp bed in about 5 fathoms, sandy bottom, with Lopez Point bearing about 287°. A rock covered 1¾ fathoms is in the kelp beds 0.5 mile southeastward of Lopez Point.

Harlan Rock, 10 feet high, is 0.3 mile offshore 1.7 miles east-southeastward of Lopez Point. The rock is conspicuous only when approaching the anchorage. A shoal covered ¾ fathom is 680 yards southeastward from Harlan Rock.

Several peaks are prominent behind Lopez Point. **Junipero Serra Peak,** 10 miles northeastward of Lopez Point, has pines on and near the summit. **Twin Peak** and **Cone Peak,** 4 miles northeastward of Lopez Point, are known as the twin peaks; they have scattered trees on their summits and are good landmarks even at night. An observation tower on the summit of Cone Peak is lighted when occupied.

From Lopez Point for 17.5 miles to Pfeiffer Point, the coast is rugged, and high mountains rise precipitously from the shore. The coastline makes in slightly, forming a shallow bight. Several hundred feet above the beach, the slopes are marked by numerous highway cuts, and

the highway bridges over these are conspicious from offshore.

Square Black Rock, 4 miles northward of Lopez Point, is 62 feet high and has a conspicuous cleft in its center. It is the most prominent landmark visible from offshore between Lopez Point and Pfeiffer Point.

Dolan Cone, 4.5 miles northward of Lopez Point, is white in appearance and 77 feet above the water.

Little Slate Rock, 7.5 miles northward of Lopez Point, is 4 feet high; **Slate Rock** is 18 feet high. Both rocks are discernible only when close inshore.

A prominent dwelling, visible westward and northward, is on a bluff 5 miles southeastward of Pfeiffer Point. Several conspicuous highway bridges cross the canyons. The highway leaves the coast about 3.5 miles southward of Pfeiffer Point and does not appear again until northward of Point Sur.

A deep submarine valley makes in from the southward in the bight 13.5 miles northward of Lopez Point and 4.5 miles southeastward of Pfeiffer Point. The head of the canyon parallels the shore for about a mile and the 100-fathom curve lies only 500 yards from shore.

Chart 5476.—Pfeiffer Point, 17.5 miles northward of Lopez Point and 6 miles southward of Point Sur, is 400 to 500 feet high; it is the seaward end of a long ridge 2,000 feet high, 1.5 miles northeastward of the point. The point presents a bold, precipitous, light-colored face to seaward. It is distinguished from the southward by its color, and from northward the pointed summit stands out. The point is more prominent from northward than from southward. **Sycamore Canyon** is immediately northward of the point.

Anchorage, affording fair protection in northerly and northwesterly weather, may be had for small vessels about 0.9 mile east-southeastward of Pfeiffer Point and 0.5 mile offshore in 10 fathoms, sandy bottom, with chain sufficient to clear the kelp line. Small boats may anchor in a bight in the kelp about 0.2 mile offshore, just northward of the anchorage, and obtain better protection. This anchorage is used extensively by local fishermen. Access by land is difficult as the road is poor.

Cooper Point, 1.5 miles northwestward of Pfeiffer Point, is marked by a prominent pinnacle 172 feet high and an off-lying rock 18 feet high.

From the mouth of **Big Sur River,** 3.5 miles northward of Pfeiffer Point, to Point Sur, the shore is low, with sand beaches and dunes extending eastward. Sunken rocks and ledges extend a mile offshore in some places between Cooper Point and Point Sur.

False Sur, 1.2 miles southeastward of Point Sur Light, is a 206-foot rounded hillock of somewhat similar appearance to Point Sur, and during fog and low visibility may be mistaken for it.

Point Sur, 121 miles northwestward of Point Arguello and 96 miles southeastward of San Francisco Bay entrance, is a black rocky butte 362 feet high with low sand dunes extending eastward from it for over 0.5 mile. From northward or southward, it looks like an island and in clear weather is visible about 25 miles. The buildings on the summit of Point Sur may confuse the stranger. **Point Sur Light (36°18.4′ N., 121°54.0′ W.),** 270 feet above the water, is shown from a 50-foot gray stone tower on the seaward face of the point. A radiobeacon and fog signal are at the station. Recently construction was started on a number of buildings for oceanographic studies about 0.5 mile eastward from the light. A lighted float of the Scripps Institution of Oceanography is 78 miles southwestward of the light.

Pico Blanco, 4.5 miles eastward of Point Sur, rises from the long ridge bordering the south side of Little Sur River. The pointed and white-topped peak is prominent in clear weather from both northward and southward of Point Sur.

Sur Rock, 1.8 miles south-southeastward from Point Sur Light, is awash nearly 0.8 mile offshore. A shoal covered 2 fathoms, 0.3 mile westward of Point Sur, breaks heavily in all but very smooth weather. About 0.5 mile southwestward from Sur Rock is a shoal covered 4½ fathoms that breaks in heavy weather. Extending 0.9 mile from Sur Rock toward Point Sur are many covered rocks that show breakers in moderately smooth weather. Foul ground lies between the rocks and the beach. These dangers are usually well marked by kelp, but it is a dangerous locality in thick or foggy weather, and vessels should stay in depths greater than 30 fathoms.

Chart 5402.—The coast trends north-northwestward from Point Sur for 17 miles to Point Cypress, then northeastward for 4 miles to Point Pinos.

Monterey Bay is a broad open bight 20 miles wide between Point Pinos and Point Santa Cruz. The shores decrease in height and boldness as Point Pinos is approached, while those of Monterey Bay are, as a rule, low and sandy. The valleys of Salinas and Pajaro Rivers, which empty into the eastern part of Monterey Bay, are marked depressions in the coastal mountain range and are prominent as such from a considerable distance seaward. From Point Santa Cruz the coast curves westward and northward for 23 miles to Pigeon Point, and then extends for 25 miles in a general north-northwesterly direction to Point San Pedro, the southern headland of the Gulf of the Farallones.

Between Point Cypress and Point Pinos the coast is bold and the 30-fathom curve is less than a mile from shore in many places; deep submarine valleys extend into Carmel Bay and Monterey Bay. Northward of Monterey Bay, depths are more regular and the few dangers extend less than a mile from shore.

Chart 5476.—Just north of Point Sur a sandy beach and bluff continue for 1.8 miles to **Little Sur River,** where the coast becomes bold, the 30-fathom curve lying in many cases less than a mile from shore. The highway returns to the coast just north of Point Sur and is visible from seaward until it reaches Carmel Point. It is marked by several bridges.

Ventura Rocks, 2.2 miles northward of Point Sur, are two rocks close together, about 0.6 mile offshore. The northern rock is conical-shaped and 12 feet high. It is

fairly conspicuous when seen from the northward with the sand bluff north of Point Sur as a background, but when seen from the southward it is confused with the rocks near the beach and to the northward. The southern rock uncovers.

From the conspicuous valley of the Little Sur River for more than 7 miles to Soberanes Point, the coast, although moderately straight, is bold, rugged, and broken, with numerous detached rocks and covered ledges close inshore.

Bixby Landing, 4 miles north of Point Sur, is identified by a prominent concrete arch bridge showing well to the westward but obscured to the northward. Less prominent is another concrete arch bridge on the north side of the 620-foot hill in this locality.

Soberanes Point projects slightly from the general trend of the coast. An isolated 200-foot grassy hillock lies immediately back of the point, and a grassy ridge extends inland to heights of 1,600 feet.

The 4.6-mile coastline from Soberanes Point to Carmel Point is rugged and broken, but becomes less precipitous and the mountain ridges lessen in height as Carmel Point is approached. Innumerable rocks and ledges extend in some cases over 0.3 mile offshore.

Lobos Rocks, a group of small rocky islets, are nearly 0.5 mile westward of Soberanes Point. The two larger islets are white-topped, and each is about 40 feet high. From seaward they rise abruptly from 20 fathoms, but there is foul ground between them.

Mount Carmel, 7.3 miles northeastward of Point Sur, is round and bare on the summit. This peak and **Pico Blanco,** 4.5 miles east by north of Point Sur, sometimes can be seen when the lower land is covered by fog or haze.

Yankee Point, 2.5 miles northward of Soberanes Point, projects 0.3 mile from the general trend of the coast. The seaward face is irregular and broken, with numerous detached rocks. **Yankee Point Rock,** 6 feet high, is 125 yards westward of the point. A covered rock that generally breaks is 0.4 mile southward of the point and the same distance offshore.

Carmel Point, the outer tip of **Point Lobos** and the southern point at the entrance to Carmel Bay, is an irregular, jagged, rocky point 100 feet high. **Whalers Knoll,** the 200-foot-high hill 0.5 mile east of Carmel Point, is one of the prominent knobs on Point Lobos. There are rocks off the point. **Whalers Rock,** 12 feet high and 0.5 mile southwestward, is the most conspicuous and the farthest offshore. This rock is more prominent from northward than from southward.

The entire Point Lobos area is included in a State Park reserve; rules prohibit landing anywhere but in **Whalers Cove,** the bight on the north shore 0.7 mile east of Carmel Point.

Carmel Bay is a 2.8-mile wide open bight between Carmel Point and Point Cypress. The beach in front of the city of Carmel is low, but the land on the south side of the bay is bare and mountainous, and the north side is hilly and heavily wooded.

Carmel Bay affords shelter in northerly and southerly weather to small craft having local knowledge. In northerly weather anchorage may be had in two coves on the northern shore, **Pebble Beach** on the west and **Stillwater Cove** on the east. These are shallow kelp-filled bights, with rock and gravel bottom. Anchorage is in 1 to 3 fathoms, but local knowledge is necessary to avoid the dangers. Stillwater Cove has a landing at its head with 5 feet alongside. In southerly weather, anchorage may be had in **Carmel Cove,** a small indentation on the southern shore about a mile eastward of Carmel Point, in 3 to 4 fathoms, rock or gravel bottom, but there is a rock covered 1¾ fathoms near the middle of the cove.

Carmel Canyon, a deep submarine valley, heads in the southeastern part of Carmel Bay and has depths of 50 fathoms less than 0.2 mile from the beach. The bay is not recommended for strangers.

On the northeastern shore of Carmel Bay, and northward of **Carmel River,** is the city of **Carmel.** The lights of Carmel are prominent on a clear night. The Carmel Mission at the southern end of the town is a conspicuous structure.

Point Cypress, on the northern side of the entrance to Carmel Bay, is comparatively low and extends about 2 miles beyond the general trend of the coast. The cliffs are steep, and numerous detached rocks are close under them. The point is heavily wooded to within 400 yards of its tip. **Point Cypress Rock,** 12 feet high, is 450 yards northwestward of Point Cypress and is prominent from either northward or southward. A lighted gong buoy is northwestward of the point.

Chart 5403.—From Point Cypress to Point Pinos, the coast trends northeastward for 4 miles. Numerous small rocks and ledges closely border the shoreline. The land is low, with the height of the cliff decreasing toward **Point Joe,** a rocky extension of the shoreline where the surf breaks heavily. From this point to Point Pinos, white sand dunes are conspicuous against the dark trees behind them, even in moonlight.

Point Pinos, on the southern side of Monterey Bay, is low, rocky, and rounding, with visible rocks extending offshore for less than 0.3 mile. The point is bare for about 0.2 mile back from the beach, and beyond that is covered with pines. **Point Pinos Light (36°38.0′ N., 121°56.0′ W.),** 89 feet above the water, is shown from a 43-foot white tower on a dwelling near the northern end of the point. A radiobeacon is at the light and a fog signal is 450 yards northwestward. A lighted whistle buoy is off the point.

Monterey Bay, between Point Pinos and Point Santa Cruz, is a broad 20-mile wide open roadstead. The shores are low, with sand beaches backed by dunes or low, sandy bluffs. **Salinas Valley,** the lowland extending eastward from about the middle of the bay, is prominent from seaward as it forms the break between the Santa Lucia Range southward and the high land of the Santa Cruz Mountains northward. The bay is free of dangers, the 10-fathom curve lying at an average distance of 0.7 mile offshore. The submarine **Monterey Canyon** heads near the middle of the bay with a depth of over 50 fathoms

about 0.5 mile from the beach near Moss Landing. Shelter from northwesterly winds is afforded at Santa Cruz Harbor and Soquel Cove, off the northern shore of the bay, and from southeasterly winds at Monterey Harbor, off the southern shore. The tidal currents are weak.

A danger zone for a firing range is in the southeastern part of the bay, and a **naval operating area** is in the northeastern part of the bay; limits and regulations are given in **204.205,** Chapter 2.

Pacific Grove, a summer resort just southeastward of Point Pinos, has no wharves.

Monterey Harbor, 3 miles southeastward of Point Pinos, is a compact resort harbor with some commercial activity and fishing. The port formerly was the home base of a large purse seine sardine-fishing industry, but in 1962 only two canneries were still operating. Depths of 20 feet or better are available in the outer harbor and entrance, and 6 feet in the small-boat basin. There are many sport-fishing landings and the small-craft basin provides good shelter for about 200 boats. An occasional surge makes in from the entrance.

Monterey, a colorful and picturesque little city on the west side of the harbor, was the capital of California under Mexican rule and for sometime after it became a state. The old adobe custom house is still standing near the waterfront, and is now used as a historical museum.

Prominent landmarks include the granite **Presidio Monument** on the brow of a barren hill. At Seaside there are several large tanks between the beach and highway. A large red-roofed building is conspicuous on a bluff above the shore 4 miles northeastward from the breakwater. Two radio towers just inshore from the sand dunes at **Marina,** 6 miles northeastward from the breakwater, are conspicuous in the southern part of Monterey Bay.

Boundary lines of inland waters.—The lines established for Monterey Harbor are described in **82.139,** Chapter 2.

A breakwater extends from the foot of Spence Street in an easterly direction for about 1,700 feet. This affords excellent protection in northwesterly weather. The outer end is marked by a light, and in the daytime usually by loud-barking sea lions. A Coast Guard station is near the inner end.

Special anchorage areas for small craft are south and southeastward of the breakwater; limits and regulations are given in **202.1** and **202.126,** Chapter 2.

See Appendix for **storm warning display.**

Quarantine, customs, and **immigration** services are handled by representatives from San Francisco.

The easterly municipal wharf is 1,600 feet long and 86 feet wide at the outer end; depths alongside the outer east and west sides are 24 feet. Freight and supplies are handled by trucks directly to the wharf; a 10-ton hoist is available. A fog signal is on the northern end of the wharf.

The inner large fish wharf has an elevator lift that can hoist boats up to 30 feet in length for ordinary repairs.

Just northwestward of cannery row is a small repair yard with a marine railway, but as this is virtually on the open sea, haul-outs can be made only when the sea is calm.

Gasoline, diesel oil, water, and ice are available at the wharves; marine hardware and groceries can be obtained. Monterey has several machine shops.

Tankers handle fuel oil supplies offshore from a float connection of a submerged pipeline at **Seaside,** 1 mile eastward of Monterey municipal wharf; mooring buoys are provided.

Monterey has good rail, air, and bus connections with San Francisco and points south.

Moss Landing, on the eastern shore of Monterey Bay 12 miles northeastward of Point Pinos, has a 500-foot commercial wharf with a depth of 50 feet at the offshore end. Vessels make fast to mooring buoys and to the wharf for handling oil.

The large aluminum-colored oil tanks at Moss Landing are prominent. Back of Moss Landing Harbor, the huge powerplant with eight tall stacks, two of which are lighted at night, and the nearby mineral processing plant with twin stacks lighted at night, are the most conspicuous objects along this stretch of the coast.

Fuel oil for the powerplant is received through a submerged pipeline marked by a buoy 0.8 mile northwestward from the Moss Landing Harbor entrance.

The anchorage off Moss Landing is unprotected, but the holding ground is good. The prevailing winds are northwesterly, but there are a few southeasterly and northerly gales during the winter.

Moss Landing Harbor, 13 miles northeasterly of Monterey, is used by a substantial fleet of fishing boats.

Boundary lines of inland waters.—The line established for Moss Landing Harbor is described in **82.137,** Chapter 2.

The channel into the harbor is through a jettied entrance to a turning basin, thence southward to an inner turning basin. The channel is marked by buoys and lighted ranges. The Federal project depth is 15 feet to the inner turning basin, 0.8 mile above the entrance. In 1962, shoaling to 12 feet was reported in the southerly half of the entrance channel.

There are landings in the harbor where fuel and water can be obtained. A 100-ton marine railway is available.

Gasoline, diesel oil, lubricants, ice, water, some marine hardware, and groceries are available at a yacht club in the northerly inlet reached by a 9-foot channel.

Two radio towers are prominent at **Palm Beach,** a small resort and camping ground back of the sand dunes 4 miles northward of Moss Landing.

Monterey Wind Gap.—The great mountain barriers northward and southward of Monterey Bay and the receding shoreline to the eastward offer a broad entrance to the cold foggy northwesterly winds of the summer, and they drive over the bay and well into Salinas Valley to the southward.

Soquel Cove is in the northeastern part of Monterey Bay, eastward of Santa Cruz Harbor. Fair shelter is afforded in northwesterly weather, but the cove is open in

southerly weather. The best anchorage is southeastward of the mouth of **Soquel Creek** in 5 to 6 fathoms, sandy bottom.

At **Seacliff Beach,** 0.5 mile westward of **Aptos Creek,** a concrete ship with two masts has been beached and filled with sand. A pleasure pier for sport fishing extends from ship to the shore.

A small fishing and pleasure wharf at **Capitola,** on the northwest side of Soquel Cove, has 11 feet alongside the landing at the outer end. There are facilities to hoist out pulling boats. Houses on the bluffs about 1.5 miles eastward of Capitola are prominent. Two radio towers and an elevated water tank 0.6 mile northwestward of **Soquel Point** are conspicuous from the east and south.

Point Santa Cruz, 20 miles northward of Point Pinos and 2.5 miles west of Soquel Point, consists of cliff heads about 40 feet above the water. The area back of the point is flat, but rises in terraces to higher land. There are two flat rocks close under the point, the outer one being the higher.

A light is shown from a white tower near the southern extremity of the point. A whistle buoy is 1.1 miles southeast of the light.

Santa Cruz Harbor is on the northern shore of Monterey Bay between Point Santa Cruz and Soquel Point. The Casino building and the roller coaster immediately to the eastward are prominent.

The city of **Santa Cruz** is on the northwestern shore of the bay. **Seabright, Del Mar,** and **Twin Lakes,** suburbs of Santa Cruz, are along the beach to the eastward.

Boundary lines of inland waters.—The line established for Santa Cruz Harbor is described in **32.135,** Chapter 2.

The Santa Cruz municipal small-craft harbor in **Woods Lagoon,** just eastward of Seabright, was nearing completion in 1962. With a jettied entrance, the basin will accommodate some 400 small craft at finger piers and floats. Project depths are 20 feet in the entrance, thence 15 feet to about the midpoint, and thence 10 feet to the head. Fueling, supplies, and repair facilities are being completed.

Santa Cruz Harbor provides good shelter in northerly weather but in northwesterly weather a heavy swell is likely to sweep into the anchorage. Good anchorage can be had anywhere off the wharf in 5 fathoms, sandy bottom. In southerly weather there is no protection in the harbor; vessels must either run for Monterey or Moss Landing Harbor, or take refuge in the new small-craft harbor.

A 900-foot municipal wharf with a cargo shed at its outer end extends out to depths of 28 feet; a fog signal is on the wharf. Landings can be made here in all but heavy southerly weather. Few vessels, other than fishing boats, land at this pier. Due to the ocean swell sweeping around the point, there is usually considerable surge, and heavy lines are required. Provisions and launch fuels may be obtained, and city water is piped to the wharf. Just eastward of this wharf is a small pleasure pier which is the westward end of the boardwalk.

There are no repair facilities except for machine work on launches. Launches up to 30 feet can be hoisted onto the wharf for hull repairs.

Santa Cruz has bus and rail connections with San Francisco and the interior.

Chart 5402.—From Point Santa Cruz the coast trends westward about 4 miles to Needle Rock Point and thence northwestward to Point Ano Nuevo. The shoreline rises from high bluffs, with a few intervening beaches, to a low flat tree-covered mountain range.

Needle Rock Point is 4 miles westward of **Santa Cruz** Light; a slender pillar of rock stands a short distance seaward from the face of the cliffs; another lower pinnacle is about 200 yards eastward. Neither is distinguishable when abreast it.

Sand Hill Bluff, 6.5 miles westward of **Santa Cruz** Light, is composed of sandstone cliffs about 50 feet high, with a rounding irregular hillock of white sand near the edge of the cliffs; this hillock is white on the northwestern side, and is covered with brush and grass on the southeastern side. Neither this bluff nor Needle Rock Point is a good landmark.

The buildings of a large cement works at **Davenport,** 9 miles northwestward of Point Santa Cruz, are conspicuous; smoke from the plant can be seen a long distance by day, and many lights are visible at night. A large aluminum-colored oil tank and a tall stack are prominent marks. A steel wharf, 2,300 feet long and with a depth of 50 feet at its end, enables vessels to load bulk cement; there are pipelines for both cement and oil. The outer 500 feet of the wharf has been destroyed. Because of the current and ground swell, vessels must lay off the dock; mooring buoys are provided.

A submarine pipeline for unloading fuel oil is off **Scott Creek,** 2 miles northward of Davenport. The end of the pipeline and the ship moorings are marked by buoys. The oil is pumped to the cement works storage tanks at Davenport.

Loma Prieta, a prominent flat-topped peak surmounting the high mountainous ridge 13 miles north-northeastward of Santa Cruz Light, is the predominating mountain feature of this section. A fire observation tower is on the top of the peak.

Waddell Creek, 14.5 miles northwestward of **Point** Santa Cruz, is in a narrow steep-sided valley. The high whitish bluffs, immediately northward, are quite prominent.

Point Ano Nuevo, 18 miles northwestward of **Point** Santa Cruz, is formed by sand dunes, 20 to 100 feet high. Two radio masts are on the point. A low black rocky islet is 0.3 mile off the point. Foul ground extends northwestward and southeastward from the islet. A white square pyramidal skeleton 49-foot tower is on the islet. Near the tower is a group of red-roofed white houses. A lighted whistle buoy is about 0.8 mile southward of the tower.

Anchorage with protection from northerly and northwesterly winds can be had in the bight southward of the point in 8 fathoms, with the tower bearing 276°, distant

0.8 mile. The kelp bed and reef, extending a little over 0.5 mile southeastward from the islet, break the force of the swell.

The 5-mile coast between Point Ano Nuevo and Pigeon Point is low and rocky. **Pigeon Point,** 22.5 miles northwestward of Point Santa Cruz, is 50 feet high and rises in a gentle slope to the coastal hills. Several moderately large detached rocks extend 350 yards southwestward. Pigeon Point was named from the wreck at this place of the clipper ship CARRIER PIGEON.

Pigeon Point Light (37°10.9′ N., 122°23.6′ W.), 148 feet above the water, is shown from a 115-foot white conical tower on the end of the point. A radiobeacon and fog signal are at the station. The light cannot be seen in the bight eastward of a line joining Pigeon Point and Pillar Point, 20 miles to the northward. The light station buildings on Pigeon Point are white with red roofs. A group of farm buildings is about 0.5 mile eastward. A row of trees, conspicuous against a background of barren hills, is about 500 yards northeastward of the light.

From Pigeon Point for 4 miles to **Pescadero Point,** the coast is nearly straight and is composed of reddish cliffs, with numerous outlying sunken and visible rocks. A rocky patch covered 1¼ fathoms is about 0.8 mile south by west of Pescadero Point; a 6½-fathom rocky patch is about 0.7 mile west-southwestward of the point.

From **Pescadero Creek,** 1.5 miles northward of Pescadero Point, the coast for 8 miles northward becomes more broken and rugged, with yellow or white vertical cliffs. A prominent whitish cliff over 100 feet high is 7.5 miles northward of Pescadero Point. About 9 miles northward of the point is the prominent white building of the Marine Coastal Receiving Station (KBS), surrounded by numerous antenna poles.

The coast is broken by several small streams in deep steep-sided valleys. Northward of the high cliff, a low flat tableland extends northward for 9 miles and then bends sharply westward to Pillar Point, forming Half Moon Bay. The land consists generally of grass-covered rolling hills with ranch houses and cultivated ground in the foreground.

Chart 5520.—Pillar Point, 18 miles southward of San Francisco entrance, is the southern extremity of a 2.5-mile low ridge. Several black rocks extend over 300 yards southerly of the point; from northward these appear as three or four, but from southward as only one. **Half Moon Bay** comprises the bight from **Miramontes Point** on the south to Pillar Point on the north.

Pillar Point Harbor, in the northern part of Half Moon Bay east of Pillar Point, is used by fishing vessels and pleasure craft. Depths of 10 to 20 feet are inside the harbor which is entered through a 250-yard opening in the breakwater marked by lights; greater depths are in the buoyed approaches.

Caution is necessary in approaching Pillar Point Harbor because of the foul ground off the entrance. Rocks and reefs marked by kelp extend southeastward for over a mile from Pillar Point. **Southeast Reef,** extending from 1.5 to over 2 miles southeastward of Pillar Point, is covered 4 to 20 feet and has a pinnacle rock awash at extreme low water at the southeastern end. Vessels from southward approach the harbor south and east of the lighted gong buoy marking Southeast Reef, while vessels from northward use the buoyed opening between the Pillar Point foul ground and Southeast Reef.

An L-pier 590 feet long with 13 feet alongside the 275-foot outer face is on the northeast side of Pillar Point Harbor. Water and electricity are piped to all parts of the facility, and gasoline and diesel oil are pumped at the landing. Repair facilities will be added.

The 600-foot wharf west of the L-pier has 10 feet at the outer end. The two wharves to the westward were being removed in 1963.

Chart 5402.—Montara Mountain, 4 miles northward of Pillar Point and 2.5 miles inland, is covered with grass and bare trees. From southward it shows as a long ridge with several small elevations upon it, but from northwestward it appears as a flat-topped mountain with four knobs on the summit. It is a prominent feature in approaching the entrance to San Francisco Bay.

Point Montara, 2.8 miles northward of Pillar Point, is the seaward end of a spur from Montara Mountain and the northwestern extremity of the ridge forming Pillar Point. It terminates in cliffs about 60 feet high with numerous outlying rocks. Covered rocks and ledges lie 0.8 mile westward of the point and extend in a northwesterly direction for about 1.5 miles. This is a dangerous locality in thick weather, and extreme caution should be used when inside the 30-fathom curve.

Point Montara Light (37°32.2′ N., 122°31.1′ W.), 70 feet above the water, is shown from a 30-foot white conical tower on the point; a fog signal is at the station. A conspicuous white tank is near the station and in the daytime is more prominent.

From Point Montara for 2.5 miles to Point San Pedro the coast is bold and rugged, rising sharply from the sea to the spurs extending from Montara Mountain. **Devils Slide** is light-colored and is the highest bluff in this locality. The highway cuts are distinctive features in the bluffs. There are no outlying rocks or dangers other than those off Point Montara.

Point San Pedro is a dark, bold, rocky promontory, 640 feet high. It is the seaward termination of Montara Mountain and is an excellent mark in clear weather from either northward or southward. A large triple-headed rock, about 100 feet high and white on its southern face, projects 0.3 mile westward from the point. A rocky area, which breaks in a heavy swell, is reported to exist about a mile northward of the point.

7. SAN FRANCISCO BAY, CALIFORNIA

Chart 5502.—San Francisco Bay, the largest harbor on the Pacific coast of the United States, is more properly described as a series of connecting bays and harbors of which San Francisco Bay proper, San Pablo Bay, and Suisan Bay are the largest. Depths of 29 feet and over are available for deep-draft vessels to San Francisco, Oakland, Alameda, Richmond, and Redwood City in San Francisco Bay proper; to Stockton on the San Joaquin River; and to Sacramento through the lower Sacramento River and a deepwater channel. Much of the local navigation is by light-draft vessels and barges.

The extensive foreign and domestic commerce of San Francisco Bay is handled through the several large ports which are the terminals for many transpacific steamship lines, airlines, and transcontinental railroads.

The eastern shore of San Francisco Bay proper is low except for rolling grassy hills in the northern part and extensive marshes intersected by numerous winding sloughs in the southern part. The western shore northward of the entrance is much bolder than the eastern shore where there are only a few stretches of low marsh. Below San Francisco, marshes and flats intersected by numerous sloughs extend to the south end of the bay.

The entrance to San Francisco Bay is through **Gulf of the Farallones** and the narrow Golden Gate. The gulf extends from Point San Pedro on the south for 34 miles to Point Reyes on the north, and has a greatest width of 23 miles from Farallon Islands on the west to the mainland.

In clear weather many prominent features are available for use in making San Francisco Bay, but in thick weather the currents, variable in direction and velocity, render the approaches difficult and dangerous. Point San Pablo, Montara Mountain, Farallon Islands, Mount Tamalpais, and Point Reyes are prominent in clear weather and frequently can be seen when the land near the beach is shut in by low fog or haze.

The first 8 miles of coast from Point San Pedro to San Francisco Bay entrance consists of whitish bluffs that reach a height of 600 feet, then a 3-mile sand beach extends to the entrance. **Shelter Cove,** on the north side of Point San Pedro, provides shelter from the easterly storms with good holding ground in gray sand bottom. The 150-foot rock close to the point also gives some protection from southerly weather.

Point Lobos (Chart 5532), on the south side of the entrance to the Golden Gate, is high, rocky, and rounding with black rugged cliffs at its base. A large water tank is on the summit. The **Cliff House** is near the southern part of the western face of the point; high and rocky **Seal Rocks** are just offshore.

Chart 5598.—Farallon Islands, 23 miles westward of San Francisco Bay entrance, are rocky islets extending northwestward for 7 miles. **Southeast Farallon,** the largest of the group, actually consists of two islands separated by a narrow impassable gorge. The larger eastern island is pyramidal in shape and 350 feet high; a small-boat landing is on the south side. **Farallon Light (37°42.0′ N., 123°00.1′ W.),** 358 feet above the water, is shown from a 41-foot white conical tower on the highest peak of the island. A radiobeacon is 290 yards south-southwestward of the light. A fog signal and dwellings of the light attendants are on the lowland on the south side of the island. The fog signal can seldom be heard northwestward of the island. **Fisherman Bay,** just northward of Farallon Light, is somewhat protected by several rocky islets on the west side and affords anchorage in 8 fathoms in the outer part. Boats can be landed on a small sand beach on the largest islet.

Hurst Shoal, 0.6 mile southeastward of Farallon Light, is covered 22 feet and breaks only in heavy weather.

Middle Farallon, 2.3 miles northwestward of the light, is a 20-foot single black rock 50 yards in diameter; several rocks covered 5 to 7 fathoms are within 0.7 mile south and southwestward of it.

North Farallon, 6.5 miles northwestward of Farallon Light, consists of two clusters of bare precipitous islets and rocks from 91 to 155 feet high, 0.9 mile in extent, and 0.3 mile wide; sunken rocks surround them.

Fanny Shoal, 9.8 miles northwestward of Farallon Light and 14 miles southwestward of Point Reyes, is 2 miles in extent and covered 2 to 30 fathoms. **Noonday Rock,** covered 13 feet, rises abruptly from 20 fathoms and is the shallowest point of the shoal; it is the principal danger in the north approach to San Francisco Bay. A lighted whistle buoy is 400 yards southwestward of the rock. Noonday Rock derives its name from the clipper ship that struck it in 1862 and sank within an hour, in 40 fathoms.

Cordell Bank (Chart 5502), 27 miles northwestward of Farallon Light and 20 miles westward of Point Reyes, is about 6 miles long and 3 miles wide; the bank is covered 20 to 40 fathoms, but depths increase rapidly outside of it.

Chart 5599.—Point Reyes, 18 miles north of Farallon Light, is a bold, dark, rocky headland 612 feet high at the western and higher extremity of a ridge running in an easterly direction for 3 miles. There is lowland north-

ward of the point, so that from northward and southward, and from seaward in hazy weather, it usually appears as an island. The point is visible for over 25 miles.

Point Reyes Light (37°59.7′ N., 123°01.3′ W.), 294 feet above the water, is shown from a 37-foot white pyramidal tower on the western extremity of the point. A radiobeacon is at the light and a fog signal is on the western pitch of the point about 30 feet below the light. Two rocks, 275 yards westward of the light, are covered about 3 feet and break in a moderate swell.

Drakes Bay, eastward of Point Reyes, was named after Sir Francis Drake, the English explorer who anchored here in 1579. The bay affords shelter in northwesterly weather in 5 to 6 fathoms, sandy bottom. **Chimney Rock** lies close under the eastern extremity of Point Reyes; a reef 200 yards eastward of the rock breaks in moderate weather. High white cliffs extend northward and eastward in a gentle curve for about 6 miles and terminate in high white sand dunes. From here the 6-mile shore eastward and southward to Double Point becomes 100- to 200-foot high rocky cliffs. Several lagoons on the northern shore empty through a common channel which is used by light-draft vessels having local knowledge.

Double Point has two high spurs 0.4 mile apart extending 200 and 320 yards from the coastline. A small 47-foot-high island is 250 yards off the northern spur, and a rock is close under and nearly connected with the longer and lower southern spur.

Drakes Bay is used extensively by vessels in heavy northwesterly weather and many fishing boats operate from here during the season. Fuel and water are available at the fish wharf inside the west point of the bay near the Coast Guard station.

The 5-mile coast from Double Point to Duxbury Point is bold with high rocky cliffs bordered by narrow sand beaches and no dangers outside the 10-fathom curve.

Bolinas Point, 15.3 miles southeastward of Point Reyes Light, is 160 feet high and the western extremity of the comparatively level tableland extending eastward to Bolinas Lagoon. An aero light and numerous radio towers are 0.6 mile northward of the point.

Duxbury Point, 16.5 miles southeastward of Point Reyes Light, is 160 feet high and yellow in color. The point is the southern edge of the tableland westward of Bolinas Lagoon.

Duxbury Reef, extending 1.2 miles southeastward of Duxbury Point, is long, narrow, and partly bare at low water. A ledge covered 30 to 36 feet extends from the reef to about 1.4 miles southward of the point; a lighted whistle buoy is about 2 miles south of the point. Great care must be exercised in passing this area.

Chart 5532.—Bolinas Bay, eastward of Duxbury Point, is an open bight 3.5 miles wide between Duxbury Point and Rocky Point. The bay affords shelter in northwesterly weather in 24 to 36 feet, sandy bottom. Care must be taken to avoid Duxbury Reef and the dangers extending up to 0.7 mile eastward of it. **Bolinas Lagoon** is separated from the bay by a narrow strip of sandy beach that is cut by a narrow shifting channel. The lagoon is shoal and entered only by small boats with local knowledge. The entrance has a depth of less than 3 feet.

Rocky Point is 100 feet high and shelving. Numerous detached rocks are within 200 yards of the high and precipitous cliffs on the southern side of the point.

The 6-mile coast between Rocky Point and Point Bonita is very rugged and broken. The cliffs, which are seaward ends of spurs from Mount Tamalpais, rise to heights of over 500 feet and are cut by deep narrow valleys stretching inland.

Point Bonita, on the north side of the entrance to Golden Gate, is a sharp black cliff 100 feet high, increasing to 300 feet on its seaward face, 0.3 mile northward. From northwestward it shows as three heads. **Point Bonita Light (37°48.9′ N., 122°31.7′ W.)**, 124 feet above the water, is shown from a 33-foot white tower on the southern head. A radiobeacon and fog signal are at the station. In summer the cliffs are white with bird droppings, but the first heavy rain restores them to their natural black color. There are a few detached rocks surrounding the point, but these do not extend over 200 yards offshore.

Bonita Cove, eastward of Point Bonita, is occasionally used as an anchorage by small vessels. The anchorage is close under Point Bonita in about 36 feet.

Mount Tamalpais, 7 miles northward of Point Bonita, is visible for over 60 miles in clear weather. From southward and westward it shows three summits of which the westernmost is the highest and the easternmost with a lookout tower is the sharpest. The mountain is covered with bushes and scrub trees, giving it a dark appearance which contrasts strongly with the surrounding hills, especially in summer when the hills assume a light reddish color.

San Francisco Lightship (37°45.0′ N., 122°41.5′ W.), with red hull and the name SAN FRANCISCO in large white letters on the sides, is 9 miles west-southwestward of San Francisco Bay entrance; the light is 55 feet above the water. The lightship has a fog signal and a radiobeacon. The code flag signal and radio call is NNCS. **Storm warning displays** are made during the daytime.

San Francisco Bar, with depths less than 36 feet, extends in a semicircular shape from 3 miles south of Point Lobos to within 0.5 mile of the shore at Point Bonita; the extreme outer part is about 5 miles west-southwestward of San Francisco Bay entrance. **Potatopatch Shoal**, on the northern part of the bar, has depths reported to be less than 23 feet. The name is said to have originated from the fact that schooners from Bodega Bay frequently lost their deck load of potatoes while crossing the shoal. The southern part of the bar has depths of 32 to 36 feet.

Golden Gate, the passage between the ocean and San Francisco Bay, is 2 miles wide at the western end between Point Bonita and Point Lobos, but the channel is reduced in width to 1.5 miles by Mile Rocks and to less than 0.7 mile by the Golden Gate Bridge pier. Depths in the passage vary from 108 feet to over 300 feet.

Mile Rocks, 700 yards northwestward of the sharp projecting point off **Lands End** on the northern face of Point Lobos, are two small 20-foot-high black rocks about

100 feet apart. **Mile Rocks Light (37°47.6′ N., 122°30.6′ W.)**, 78 feet above the water, is shown from a white cylindrical tower on dwelling on the outer and larger rock; a fog signal is at the station.

Passage between Mile Rocks and Point Lobos should not be attempted because of the covered and visible rocks extending over 300 yards from shore and the rocks covered 6 and 14 feet southward of Mile Rocks Light.

The southern shore of the Golden Gate extends in a gentle curve eastward for 2 miles to Fort Point, forming a shallow bight called **South Bay.** The cliffs rise abruptly from narrow beaches, except near the middle of the bight where a valley terminates in a sand beach 0.3 mile long. Sailing craft are sometimes obliged to anchor here when becalmed, or when meeting an ebb current, to avoid drifting onto Mile Rocks, but the anchorage is uncomfortable and it is difficult to get underway from it.

Fort Point projects slightly from the high cliffs, and is marked by a square red brick fort with a stone seawall in front. The fort is obscured by the southern end of the Golden Gate Bridge. A Coast Guard station is eastward of the point.

The northern shore of the Golden Gate is bold and rugged, with reddish cliffs rising abruptly from the water's edge to over 600 feet.

Point Diablo, 1.4 miles eastward of Point Bonita, rises abruptly from a 0.1-mile sharp projection to a height of over 200 feet with deep water on all sides. A light is shown from a white house on the end of the point; a fog signal is at the light.

The mile-long shore between Point Diablo and Lime Point forms a shallow bight with steep cliffs. Near the middle of the bight the cliffs are cut by a narrow valley which ends in a low beach at the shore.

Lime Point, 2.5 miles eastward of Point Bonita, is high and precipitous, and rises abruptly to a height of nearly 500 feet in less than 0.3 mile. A light is shown from a white brick building at the end of the point; a fog signal is at the light.

Golden Gate Bridge, crossing the Golden Gate from Fort Point to Lime Point, has a clearance of 232 feet at the center of the 4,028-foot wide channel span between the 740-foot high supporting towers; the least clearance is 211 feet. The center of the span is marked by a fixed green light and a fog signal; a light and fog signal are on the south pier. Aero obstruction lights mark the tops of the bridge towers. Do not rely on radiobeacon bearings when within 0.5 mile of the bridge.

Boundary lines of inland waters.—The line established for San Francisco Harbor is described in **82.133,** Chapter 2.

Channels.—The principal approach to San Francisco Bay is through the buoyed **Main Ship Channel** over the bar on bearing **070°** toward Alcatraz Light. The project depth is 50 feet in the 2,000-foot wide channel.

From southward, some coasters and fishing vessels drawing not more than 15 feet use buoyed **South Channel,** parallel to and 0.7 mile off the peninsula shore.

From northward, coasters and some other vessels with local knowledge drawing not over 18 feet use buoyed **Bonita Channel,** between the eastern end of Potatopatch Shoal and the shore northward of Point Bonita. The channel is narrowed to 0.2 mile by several rocky patches including **Sears Rock,** covered 19 feet, 1.2 miles northwestward of Point Bonita. The southern portion of the channel is marked by a lighted range bearing **137°**; Mile Rocks Light is the front, and a light shown from a white building on the bluff is the rear; the rear light is visible only on the range line.

Caution.—Vessels departing San Francisco Bay through Bonita Channel on the ebb current must use extreme caution when crossing the tide rip off Point Bonita. When the bow passes the rip the stern is thrown to port and, unless promptly met, the vessel will head straight for the rocks off the point. Vessels favoring Potatopatch Shoal too closely have reported a set toward it.

Neither South Channel nor Bonita Channel should be used by large vessels. Strangers wishing to cross the bar in thick weather should either wait for clearing or take a pilot.

Currents.—The currents at the entrance to San Francisco Bay are variable, uncertain, and at times attain considerable velocity. Immediately outside the bar there is a slight current to the northward and westward, known as the **Coast Eddy Current.** The currents at San Francisco Lightship are described in some detail in the Tidal Current Tables. The currents most affecting navigation in this vicinity are the tidal currents. Across the bar the flood current converges toward the entrance and is felt sooner around Point Lobos and Point Bonita than across the Main Ship Channel. The ebb current spreads from the entrance over the bar, but the main strength is west-southwestward, parallel with the southern edge of the Potatopatch Shoal, and through the Main Ship Channel. In the Bonita Channel the ebb current is weak and of short duration, the flood current beginning so early that during the last half of the ebb in the Golden Gate the current in Bonita Channel forms an eddy flowing southeastward around Point Bonita into Bonita Cove.

In the vicinity of Mile Rocks the currents attain considerable velocity within a few minutes after slack on both flood and ebb.

In the Golden Gate the flood current sets straight in, with a slight tendency toward the north shore, with heavy overfalls both at Lime Point and Fort Point when strong. It causes an eddy in the bight between Point Lobos and Fort Point. The ebb current has been observed to have a velocity of more than 6.5 knots between Lime Point and Fort Point, and it sets from inside the bay on the north side toward the latter point. Like the flood current, it causes an eddy in the bight between Fort Point and Point Lobos, and a heavy rip and overfall reaching about 0.25 mile southward from Point Bonita. At the Golden Gate Bridge there are large current eddies near the foundation piers which cause ships to sheer off course.

Daily current predictions are given in the Tidal Current Tables. Hourly directions and velocities of the tidal

current throughout the bay are shown on the Tidal Current Charts, San Francisco Bay.

Weather.—In common with the more northerly section of the Pacific coast of the United States, the San Francisco Bay entrance experiences fog more frequently during the summer than during the other seasons. Fog is generally brought in from seaward by westerly winds about sundown, and ordinarily continues until about noon of the following day. In winter, morning or tule fogs frequently occur, these forming over the lowlands of the central valley and over the bay.

During summer the fog often drifts in only as far as the Golden Gate, partially obscuring the bridge and shoreline, while the remainder of the bay is comparatively clear. Sausalito and Richardson Bay have much less fog than the Golden Gate.

Westerly winds prevail in this section of the Pacific coast throughout the greater part of the year; northerly winds are most prevalent during December and January. Southerly gales occur in the winter. The wind normally attains its greatest velocity about 4:30 p.m. and its least velocity about 6 a.m.

During certain times of the year, especially in May and June, the northwesterly winds attain high velocity. This is also true regarding the north-northeasterly winds of November, December, and occasionally January. In the winter the most prevalent high wind is from the southeast and is followed by a southwesterly wind.

The San Francisco Bay region has comparatively few storms. Except in the winter, very few low-pressure areas move from the ocean across California; nearly all the storms that enter the United States from the west pass far northward of central California.

Routes.—The routes for approaching San Francisco Bay are described in Chapter 3. Having made San Francisco Lightship, pass southward of it and steer a **070°** course on the south side of the buoyed channel through the bar until Mile Rocks Light is abeam to starboard, then steer **057°** until beneath Golden Gate Bridge. The recommended route for outbound vessels is to pass northward of the center of Golden Gate Bridge making good a **250°** course until abeam of Point Diablo Light, thence a course of **243°** to the bar channel, and thence on the north side of the bar channel to sea.

From the Golden Gate Bridge, vessels bound for San Pablo Bay and Carquinez Strait may set a course to pass 0.5 mile off Point Blunt at the southeast end of Angel Island, thence through the buoyed channels to a point 0.6 mile west of East Brother Island Light off Point San Pablo, thence a course to pass close aboard the fairway buoy in San Pablo Bay, and thence through the buoyed channel to Carquinez Strait.

Pilotage.—Pilotage in and out of San Francisco Bay is compulsory for all foreign vessels and United States vessels under register. The San Francisco Bar Pilots keep boats on station 24 hours a day near the lightship or, in foul weather, seaward of it. If prior arrangements have not been made with the pilots association offices on Pier 7, masters may give these signals upon approaching the lightship:

Clear visibility: by day, hoist code flag "G"; by night, four flashes on the signal lamp. **Limited visibility:** four long blasts.

All vessels are boarded from a small launch; masters are requested to provide the standard ladder and assist by making a lee for boarding and departing.

River pilots are engaged by prior arrangement with the ship's agent or master, or by inquiry through the bar pilots.

Chart 5535.—**San Francisco,** one of America's great cities, occupies the northerly portion of the peninsula forming the southerly entrance to the bay. The 3-mile north shore of San Francisco from the Golden Gate Bridge to the main waterfront includes the **Presidio,** a United States military reservation; several yacht harbors; Government buildings and piers on Black Point; Aquatic Park; and Fisherman's Wharf. Shoals with depths less than 10 feet extend up to 0.2 mile from the shore.

A 700-yard wide degaussing range, 1.9 miles eastward of the Golden Gate Bridge and 800 yards offshore, is marked by lighted bell buoys. Vessels are cautioned not to foul the submarine cables that extend southward from the range to the observation house on the Marina seawall.

Alcatraz Island, 2.5 miles eastward of the Golden Gate Bridge, is one of the leading marks in entering San Francisco Bay. The small island is 148 feet high and has many buildings on it. **Alcatraz Light (37°49.6′ N., 122°25.3′ W.),** 214 feet above the water, is shown from a gray tower on the highest part of the island. Fog signals are on the extreme northwestern and southeastern ends of the island. Unless authorized, vessels are prohibited from navigating within 200 yards of the shoreline of Alcatraz Island; regulations are given in **207.640,** Chapter 2.

A rock awash, marked on its westerly side by a bell buoy, is 125 yards westward of the northwestern end of Alcatraz Island.

Yerba Buena Island, 345 feet high and 2.5 miles southeastward of Alcratraz Island, is of small extent, irregular in shape, and is covered with a scrubby growth of trees. On its summit is a lookout tower used by the Navy. The wharves of the Naval Training Station and Corps of Engineers are in the small cove on the eastern face of the island. A Coast Guard buoy depot is on the southeast end of the island.

Yerba Buena Island Light (37°48.4′ N., 122°21.7′ W.), 95 feet above the water, is shown from a white octagonal tower at the extreme southeastern point of the island; a fog signal is at the light. The buildings are white and part of the bluff is whitewashed to make the station more discernible.

Treasure Island is a low filled area northward of and connected by a causeway to Yerba Buena Island. Built originally for the San Francisco International Exposition of 1939–40, it is now used by the Navy. Some of the piers

around the island have lights and fog signals. A shoal covered by 15 feet, off the northerly end of the island, is marked by a buoy.

When the prevailing westerly winds are blowing, deep-draft vessels proceeding to the berthing area on the eastern side of the island may have extreme difficulty making the 90° turn from the narrow channel between the 30-foot curves southeastward of Yerba Buena Island.

A measured course, on the west side of Treasure Island, is 6,102 feet long on bearing 330°44′ and marked by white poles with small white targets. The southern range is on the northwestern extremity of Yerba Buena Island and the northern range is near the northwestern end of Treasure Island.

Naval restricted areas are off the north end of Treasure Island and between this island and Yerba Buena Island; limits and regulations are given in **207.640,** Chapter 2.

San Francisco-Oakland Bridge crosses the bay from **Rincon Point** in San Francisco to Yerba Buena Island, thence to Oakland. The clearance between piers **B** and **D** is 217 feet.

Prominent features.—The skyline of the city of San Francisco is, of course, historically unmistakable, with several dominant landmarks: the old Ferry Building at the foot of Market Street, the tower and outside elevator shaft of the Fairmont Hotel, the "Top of the Mark" Hopkins Hotel, the Coit Tower on Telegraph Hill, and the Bay Bridges with their freeway elevated approaches.

The **Ferry Building,** once the terminal of many ferryboats, now houses the **Port of San Francisco** and its **San Francisco Port Authority** offices, the offices of the Marine Exchange, Inc., and the many offices and exhibits of the World Trade Center. Located as it is in the center part of the Embarcadero, the Ferry Building with its 240-foot clock tower, illuminated at night, remains an outstanding landmark on the San Francisco side of the harbor.

Channels.—Depths of 45 feet or more are available from the Golden Gate Bridge to most of the anchorages; depths ranging from 29 to 40 feet can be taken to most of the San Francisco piers.

Anchorages.—General, naval, and explosives anchorage areas have been established in San Francisco Bay; limits and regulations are given in **202.224,** Chapter 2. The western part of Anchorage 7, westward of Treasure Island, is used by vessels undergoing examination by quarantine, customs, and immigration officials.

Dangers.—Anita Rock, 1.1 miles eastward of Fort Point and 300 yards from shore, uncovers; it is marked by buoys.

There are several rocky patches with depths of 33 to 35 feet westward and northwestward of Alcatraz Island that must be avoided by deep-draft vessels.

Heavy tide rips occur in the vicinity of Alcatraz Island.

Tides.—The mean range of tide at San Francisco is 4 feet. The range between mean lower low water and mean higher high water is 5.7 feet. A range of about 9 feet may occur at the time of maximum tides. Daily tide predictions for San Francisco Bay are given in the Tide Tables.

Currents.—Inside the Golden Gate the flood current sets into all parts of the bay and causes swirls from the Golden Gate as far eastward as Alcatraz and Angel Islands and through Raccoon Strait, northward of Angel Island. The ebb current, inside the Golden Gate, is felt first along the southern shore. In the Golden Gate, the average duration of the ebb stream is somewhat greater than that of the flood. In the Sacramento and San Joaquin Rivers there is a weak flood current during periods of freshets.

At the San Francisco-Oakland Bridge there are large current eddies near the foundation piers which cause ships to sheer off course.

The flow of tidal currents throughout San Francisco Bay is clearly depicted on the Tidal Current Charts, San Francisco Bay. The charts, which may be used for any year, are referred to the times of the maximum flood and ebb currents at San Francisco Bay entrance (Golden Gate). Daily predictions are given in the Tidal Current tables.

See Appendix for **storm warning displays.**

Towage.—Tugboats are available in sufficient quantity for the traffic in the greater harbor.

Quarantine service is performed on a 24-hour basis, the off-hours by special arrangement in advance. Quarantine is enforced in accordance with the regulations of the U.S. Public Health Service. There is a Public Health Service Hospital in the city.

Customs.—San Francisco is the headquarters of the customs collection district and a port of entry; marine documents are issued.

Immigration officials are stationed at San Francisco.

Harbor regulations.—The Port of San Francisco is under the control of the State of California, and its management is vested in the San Francisco Port Authority, in direct charge of the port director of that body. The office of the Chief Wharfinger is on the Embarcadero at the foot of Pier 1.

The harbor regulations are prescribed by the San Francisco Port Authority and enforced by the Chief Wharfinger.

Wharves.—The Port of San Francisco maintains extensive terminals with belt-line connections and modern cargo-handling facilities. Depths of 20 to more than 30 feet are alongside most of the piers. A complete description of wharves and piers at San Francisco may be obtained from the Port Series, a Corps of Engineers publication.

Supplies.—Fuel oils, gasoline, marine hardware, and groceries may be had in any desired quantity. Fuel oil is usually delivered by barge. Water can be obtained on the wharves or by waterboat.

Repairs.—San Francisco, Oakland, and Alameda have facilities for making repairs to vessels and machinery of all kinds and sizes. The largest commercial floating drydock in San Francisco has a length of 584 feet at the keel blocks, clear width of 100 feet, depth of 28 feet over the blocks, and lifting capacity of 22,000 tons. There are several smaller drydocks on the San Francisco side, and

several marine railways and floating docks on the Oakland side.

Communications.—San Francisco is the terminus of several transpacific steamship lines and the port of call for numerous lines of coastal and intercoastal vessels. It is served by four transcontinental railroads and many airlines.

Special signals in use at San Francisco by International Code Flag and whistle include the following: Quarantine, letter **Q**, 1 long 1 short; Police, Ensign in rigging, 5 short; Fire, no flag, standard signal of 5 prolonged blasts for ships afire in port; Waterboat, letter **W**, no whistle; Customs-Barge office, no flag, 3 short 1 long; Immigration, no flag, 1 short 1 long 1 short; Marine Dept., S.F.C. of C. letter **M**, 1 short 1 long; Stockton pilots, letter **U**, 1 long 3 short; Towboat companies: Bay Cities, letter **B**, 1 long 3 short; Crowley, letter **C**, 4 short 1 long; Harbor, letter **H**, 2 long 2 short; Smith-Rice, letter **S**, 3 short; Red Stack, letter **T**, 1 long 3 short 1 long.

The **Marine Exchange** maintains a modern ship lookout and reporting station at the end of Pier 45, just east of Aquatic Park. Radar and UHF contact on the Harbor Channel 12 (KMG 389, 156.6 mc) keep 24-hour watch on ship movements.

China Basin, 1.1 miles southward of the Ferry Building, is the site of a banana terminal with rapid-handling machinery. **Channel Street,** a canal extending 0.5 mile southwesterly from China Basin, has depths of 13 to 24 feet. The drawbridges across the canal have a least clearance of 1 foot.

Islais Creek, 2.9 miles southward of the Ferry Building, has depths of 12 to 31 feet. A highway bridge across the creek has a bascule span with a clearance of 0 feet.

Small-boat facilities.—San Francisco Municipal Yacht Harbor, 1.8 miles eastward of the Golden Gate Bridge, has depths of 8 to 12 feet to the berths. A prominent 30-foot stone tower is 0.2 mile westward of the entrance.

Aquatic Park, 2.6 miles eastward of the Golden Gate Bridge, is a pleasure resort with a curved recreation pier. Depths of 9 to 16 feet are inside the basin.

Fisherman's Wharf is 2.8 miles eastward of the Golden Gate Bridge. Depths of 15 feet or more are available to the wharves. Gasoline, diesel oil, marine hardware, and groceries are available. There is a small marine railway; hull and engine repairs can be made.

Central Basin, 1.9 miles southward of the Ferry Building, has depths of 10 to 22 feet. Gasoline, diesel oil, and water are available. There is a 70-foot marine railway and a 2½-ton portable lift; hull and engine repairs can be made.

On the north side of **Hunters Point,** 3.8 miles southward of the Ferry Building, there are facilities for small boats. The largest marine railway can haul out boats up to 150 feet in length for hull and engine repairs; the largest lift is 7½ tons.

Chart 5531.—Southward of San Francisco, **Point Avisadero,** which is the eastern extremity of Hunters Point, **Sierra Point, Point San Bruno,** and Coyote Point, all on the western shore of the bay, are prominent natural features. The San Francisco Naval Shipyard is at Hunters Point, where a **naval restricted area** is offshore; limits and regulations are given in **207.640,** Chapter 2. The Bayshore Freeway extends southward on a filled area from the vicinity of **Candlestick Point,** and cuts back inland at Sierra Point. **Coyote Point (Point San Mateo)** is covered by a heavy growth of trees and is raised as an island. A small-craft basin is here.

A **seaplane restricted area** extends offshore from Point San Bruno to off Coyote Point; limits and regulations are given in **207.640,** Chapter 2.

The **San Mateo Bridge** crossing the lower part of San Francisco Bay near **San Mateo** has a vertical lift with clearances of 35 feet down and 135 feet up. A fog signal is on the westerly pier of the lift span. A power cable with a clearance of 160 feet at the lift span crosses the bay just southward of the bridge.

Redwood Creek, 4 miles southeastward of San Mateo Bridge, is entered through a marked channel that leads to **Port of Redwood City,** 2.5 miles above the mouth. Traffic in the waterway includes petroleum products, bulk cement, gypsum rock, and salt. The project depth of 30 feet is maintained. A power cable across the waterway has a clearance of 155 feet. A prominent cement plant is at the junction with **Westpoint Slough,** just north of the port.

Most of the wharves and facilities are managed by the Port of Redwood City. The port authority maintains 30 feet alongside the principal wharves. Diesel oil and gasoline are pumped, and water, ice, some marine supplies, and groceries are available. **Redwood City** is 2 miles southward of the port facilities.

Depths of 8 feet or more can be taken to the small-boat facilities south of the port. Gasoline, diesel oil, water, and marine hardware are available. A marine railway can haul out boats up to 60 feet in length. There is a 20-ton portable lift; hull and engine repairs can be made.

Ravenswood Point and **Dumbarton Point** are at the head of the bay and the mouth of Coyote Creek. Two bridges and an aqueduct cross the bay at this point. The **Dumbarton Bridge** is a lift span with clearances of 9 feet down and 135 feet up. A fog signal is on the western pier. About 1,100 yards southeastward of the bridge are two flumes, with a clear opening between them of about 900 yards, which supply the city of San Francisco with water. The eastern flume tunnels the entire way and is marked by a large sign showing the word PIPELINE. The western flume is carried on a trestle to a concrete house at the edge of the channel where it tunnels. The railroad bridge, just southward, has a swing span with a clearance of 13 feet. A fog bell is on the bridgekeeper's house.

Coyote Creek has many tributary sloughs. The main channel is marked as far as **Calaveras Point,** about 4 miles above the railroad bridge at Dumbarton Point. The power cable, 1.3 miles above Calaveras Point, has a clearance of 65 feet.

A narrow marked channel extends from the railroad bridge to the mouth of **Mayfield Slough,** on the east side

of **Palo Alto Municipal Airport.** A power cable over the entrance to the slough has a clearance of 125 feet. A depth of 5 feet can be taken to a yacht club 0.5 mile above the entrance. A 52-foot marine railway and a 2-ton lift are available; hull and engine repairs can be made.

Alviso is at the headwaters of **Alviso Slough.** There is little water traffic by scows and light-draft vessels, hauling fruit and farm produce.

Chart 5535.—Alameda is on an island separated from the mainland by **San Leandro Bay** on the east, and Oakland Inner Harbor and Tidal Canal on the north. The **Naval Air Station** is on a filled area just west of the city and south of Oakland Inner Harbor.

There is a **seaplane restricted area** southward of the Naval Air Station where no vessel may enter without prior approval of the Naval authorities; limits and regulations are given in **207.640,** Chapter 2.

Repairs.—Alameda has shipbuilding and repair yards with marine ways and floating drydocks. The largest drydock has a length of 528 feet, width of 90 feet, 29 feet on the blocks, and a lifting capacity of 16,500 tons.

Oakland, on the eastern or mainland shore opposite San Francisco, is the second largest city on San Francisco Bay. It is the terminus of the transcontinental railroads entering the San Francisco Bay area.

The **Port of Oakland** is under the jurisdiction of the Board of Port Commissioners of the city of Oakland and is entirely distinct from the Port of San Francisco. Oakland is a separate customs port of entry. There is an appraiser's store in the city at the foot of Grove Street.

Oakland Inner Harbor, which is adjacent to the most highly developed section of Oakland, is an estuary 9 miles long. It is bordered on the north by Oakland and on the south by Alameda. At the eastern end of the harbor, artificial **Tidal Canal** leads to San Leandro Bay where a channel continues to the Metropolitan Oakland International Airport.

Channels.—A Federal project provides for channel depths as follows: Bar Channel to and including Oakland Outer Harbor, 35 feet; Oakland Inner Harbor Channel to the end of Brooklyn Basin South Channel, 4.5 miles above the entrance, 35 feet. The channels are generally maintained.

Brooklyn Basin North Channel has a controlling depth of about 12 feet. The controlling depth in the channel through Tidal Canal is about 16 feet, thence about 7 feet through San Leandro Bay to the airport.

For information as to conditions of the channel to Alameda Naval Air Station, mariners are advised to consult the Naval Port Control Office, San Francisco.

A measured nautical mile on course 105°32′ is in Oakland Inner Harbor, just inside the entrance channel. The markers are on the northerly side of the channel.

A restricted area is in Oakland Inner Harbor from the entrance to the easterly boundary of the Naval Air Station; limits and regulations are given in **207.640,** Chapter 2.

Bridges.—The fixed highway bridge across Brooklyn Basin at the east end of Government Island has a 27-foot width and a clearance of 11 feet. The three highway drawbridges across Tidal Canal have a least clearance of 6 feet. The vertical lift railroad bridge across Tidal Canal has clearances of 13 feet down and 135 feet up. Navigation regulations for passing through the railroad and highway bridges at Fruitvale Avenue are given in **203.712,** Chapter 2.

There are many small-boat facilities on both sides of the channel from Oakland Inner Harbor entrance to the airport at the south end of San Leandro Bay where gasoline, diesel oil, water, marine hardware, and groceries can be obtained. The largest marine railway can haul out boats up to 137 feet in length; the largest lift is 14 tons. Hull and engine repairs can be made.

The **Naval Supply Center** occupies **Middle Harbor,** between Oakland Inner Harbor entrance and the Oakland Mole. A channel from the entrance to the Naval Center piers has a controlling depth of about 27 feet. Regulations governing navigation in this area are given in **207.640,** Chapter 2. For depths to the naval installations, masters are advised to contact the Naval Port Control Office.

The **Oakland Outer Harbor,** between the Oakland Mole on the south and the Bay Bridge approach on the north, is the site of several large terminals.

A shipbuilding and repair firm in Oakland has a maximum drydock capacity of 12,000 tons, and another firm has marine railways capable of hauling out up to 1,000 tons. All kinds of repairs are made to both hulls and engines, and all kinds of marine hardware and supplies are available.

Chart 5532.—Berkeley, the seat of the University of California, adjoins Oakland and **Emeryville** to the northward. There is a long pier extending into the bay, but it is used for fishing purposes only. A 32-foot opening in the pier a mile offshore can be used by small craft in an emergency. In clear weather the Campanile (bell tower) at the university shows prominently from the bay.

Berkeley Yacht Harbor, on the northern side of the long pier, is enclosed by breakwaters. The southern side of the entrance is marked by a light and fog signal. A depth of 7 feet can be taken into the harbor. Gasoline, diesel oil, water, and marine hardware are available. A boat repair shop has a 20-ton lift; hull repairs can be made. The office of the harbormaster is on the city wharf.

Southampton Shoal Light (37°52.9′ N., 122°24.0′ W.), 32 feet above the water, is shown from a white cylindrical tower near the southern end of the 2-mile long shoal. A fog signal is at the light. A degaussing range is on each side of the channel between Southampton Shoal Light and Angel Island.

Vessels going from San Francisco Bay proper to the upper bays and rivers usually use the buoyed 35-foot project channel through the shoal area northwestward of Southampton Shoal Light, which leads through the easterly opening of the Richmond-San Rafael Bridge.

Red Rock, 3.2 miles north-northwestward of Southampton Shoal Light, is 169 feet high and prominent in

the southerly approach. **Castro Rocks,** 0.6 mile east-northeastward of Red Rock, are small and low.

The 35-foot buoyed passage westward of Red Rock is frequently used by river steamers on the ebb, as the current has less velocity, although the rips and swirls are heavy at times.

Richmond Harbor, on the eastern shore of San Francisco Bay 1.5 miles northward of Southampton Shoal Light, includes the port facilities to Point San Pablo. The harbor is the terminus of the Atchison, Topeka, and Santa Fe Railway, and is an important oil refining center and oil shipping port.

The Federal project depth of 35 feet is generally maintained in the channel leading to the port facilities at **Point Richmond** and in the inner harbor through about 2,000 feet of Santa Fe Channel. The remainder of Santa Fe Channel and basin has depths of 24 to 30 feet. A 10,000-foot training wall is on the south side of the approach channel. Depths at most of the wharves are 30 feet or more.

A modern deepwater terminal is at Point Richmond, and two modern deepwater terminals, two oil wharves, three inactive shipbuilding yards, and numerous wharves for small craft are in the inner harbor. Railway car ferry slips extend out from Point Richmond. The terminal wharf at Point San Pablo is used by large vessels for general cargo and petroleum products.

Most of the small-boat facilities are along Santa Fe Channel. Available supplies include gasoline, diesel oil, water, and marine hardware. The largest marine railway can haul out boats up to 65 feet in length; the largest lift is 2 tons; hull and engine repairs can be made.

The 21,343-foot Richmond-San Rafael Highway Bridge, 8.8 miles above the Golden Gate Bridge, is one of the longest in the world. The easterly 970-foot fixed channel span clearance is 135 feet; the westerly fixed span has a 1,000-foot opening with a clearance of 185 feet. The bridge is well lighted and the channels leading to it are marked with navigational aids.

A **restricted area** extends 0.3 mile offshore at **Molate Point,** 0.8 mile north of Richmond-San Rafael Bridge; limits and regulations are given in **207.640,** Chapter 2.

Invincible Rock, 1.3 miles north of Richmond-San Rafael Bridge, is covered 7 feet and lies almost in the middle of the approach to San Pablo Strait. **Whiting Rock,** covered 13 feet, is 0.2 mile north-northeastward of Invincible Rock. Both rocks are buoyed.

The Brothers, 1.7 miles northward of Richmond-San Rafael Bridge, are two small low flat-topped islands. **East Brother Island Light (37°57.8′ N., 122°26.0′ W.),** 61 feet above the water, is shown from a white square tower on dwelling on the eastern island. A fog signal is at the station.

Point San Pablo, 0.3 mile northeastward of East Brother Island Light, is the northwestern extremity of a low ridge of hills on the eastern shore of San Francisco Bay at its junction with San Pablo Bay. The point rises abruptly to a height of 140 feet. A dredged channel off the northeastern shore of the point is used by commercial fishermen and yachtsmen. The controlling depth in the channel is about 10 feet.

Gasoline, diesel oil, and water are available at a boat basin 0.5 mile southeastward of Point San Pablo. A marine railway can haul out boats up to 40 feet in length; hull and engine repairs can be made.

Point Cavallo, on the western side of San Francisco Bay 0.5 mile northeastward of the Golden Gate Bridge, is sharp and rocky with some visible and covered rocks under its face. **Horseshoe Bay,** a shallow bight westward of the point, is part of a military reservation and only available to the public in case of an emergency.

From Point Cavallo the steep rocky shore tends northward for 0.3 mile to **Yellow Bluff,** thence northwestward for a mile to Sausalito.

Richardson Bay, 2 miles northward of the Golden Gate Bridge, is shoal except for the southern part fronting Sausalito. Limits and regulations for the **anchorage areas** in the bay are given in **202.224,** Chapter 2.

Sausalito harbors many commercial fishing boats and pleasure craft. Several boat building and repair yards have marine ways, the largest of which can accommodate vessels up to 500 tons. General repairs to hulls and machinery can be made; supplies and fuel are available. The Corps of Engineers, which maintains the channel to a depth of about 16 feet, has an operations base and model current-flow basin at Sausalito.

Belvedere Cove, 3 miles north-northeastward of the Golden Gate Bridge, is used as a small-boat anchorage; limits and regulations are given in **202.224,** Chapter 2. Private yacht clubs are in the upper part of the cove. Gasoline, diesel oil, and water can be obtained on the north side of the cove near **Point Tiburon;** a depth of 6 feet is alongside the pumps.

Angel Island, 3 miles northeastward of the Golden Gate Bridge, is partially wooded and level on top. The irregular shaped island is separated from the mainland by Raccoon Strait.

Point Blunt, the southeastern extremity of Angel Island, terminates in a 60-foot high knob, and is connected with the island by a low neck of land. **Point Blunt Light (37°51.2′ N., 122°25.1′ W.),** 60 feet above the water, is shown from a white house with orange stripe on the point; a fog signal is at the station. A shoal with visible and covered rocks extends southeastward for 0.1 mile. Tide rips and swirls are heavy around the point, especially with a large falling tide.

Quarry Point, the eastern end of Angel Island, is a bold bluff with deep water close-to. The wharf and buildings, 0.6 mile northward of the point, have been partly destroyed by fire.

A light and fog signal are on **Point Stuart,** the western extremity of Angel Island. A shoal area covered 14 to 30 feet, extending southwestward from **Point Knox,** is marked by a lighted gong buoy.

Raccoon Strait, nearly 0.5 mile wide between Angel Island and the mainland, is sometimes used by vessels bound northward in San Francisco Bay from the Golden

Gate. The tidal currents in the strait have considerable velocity and the rips and swirls are heavy at times. A midchannel course can be followed, but care should be taken by deep-draft vessels to avoid **Raccoon Shoal,** covered 26 feet, 500 yards northward of Point Stuart Light. A strong ebb current sets directly across the channel at the east entrance.

Point San Quentin, at the western approach to the Richmond-San Rafael Bridge, has low land on either side. The buildings of the State Prison south of the bridge and the long wharf north of it are prominent.

Corte Madera Creek, at the head of a marshy bight southward of Point San Quentin, has depths of 6 to 2 feet to the fixed highway bridges, 1.5 miles above the mouth. The railroad bridge, just east of the fixed bridges, has a 40-foot bascule span with a clearance of 8 feet; drawspan regulations are given in **203.712,** Chapter 2. The fixed bridges have a 40-foot channel span with a clearance of 21 feet. The power cables between the creek entrance and the fixed bridges have a least clearance of 120 feet.

San Rafael Creek, 1.8 miles north of Point San Quentin, is used by many small craft basing at the city of San Rafael. In May 1962, the controlling depth was 6 feet through the marked entrance channel in **San Rafael Bay** to the turning basin at **San Rafael.** The power cable near the entrance has a clearance of 125 feet. A repair yard here has a marine elevator which can lift craft up to 70 feet in length and 70 tons; general repairs are made. Gasoline, diesel oil, water, some marine hardware, and groceries are available.

Point San Pedro, 3 miles northward of Point San Quentin at the western entrance to San Pablo Bay, extends 100 yards eastward of 356-foot high **San Pedro Hill.** There is a large quarry just northward of the point.

Chart 5533.—San Pablo Bay is nearly circular, 10 miles long in a northeasterly direction, with a greatest width of 8 miles. The northern part consists of low marshes intersected by numerous sloughs and a large area of shoal water and mudflats that bare at extreme low water. The southern shore is bolder, except between Point San Pablo and Pinole Point, where it is low and marshy for about 3 miles. Carquinez Strait joins San Pablo Bay with Mare Island Strait and Suisun Bay at its eastern extremity. There is considerable traffic through the bay. Deep-draft vessels pass through to load grain at points on Carquinez Strait, and to South Vallejo to load flour and discharge lumber, while many oil tankers and sugar-laden vessels pass through the bay bound for Crockett and Martinez, and up the San Joaquin River to Stockton, and the Sacramento River to Sacramento. Light-draft vessels pass through bound for points on Suisun Bay, Sacramento River, and San Joaquin River. There are several landings on the southern shore of San Pablo Bay used by light-draft vessels.

The San Francisco Bay UHF radio channel 12 (156.6 mc) connects the Marine Exchange, the towing companies, water taxis, harbor launches, and bridges on the San Joaquin and Sacramento Rivers with all ships, equipped with the UHF facilities. In addition, the river pilots and the two lift bridges inter-communicate on 154.83 mc.

The main buoyed channel through the bay extends in a gentle curve northward and eastward from the entrance to the eastern end. The Federal project depth is 35 feet across Pinole Shoal; the channel is maintained annually. Pinole Shoal Channel is reserved for use of vessels drawing more than 20 feet; navigation regulations are given in **207.640,** Chapter 2.

Limits and regulations for anchorage areas in San Pablo Bay are given in **202.224,** Chapter 2.

Shoals and flats, which uncover, extend from Point San Pablo to Pinole Point, thence northeastward to Lone Tree Point.

Pinole Point is a moderately high, rocky bluff, projecting about a mile from the southeastern shore of San Pablo Bay. A wharf is built out from the eastern side. Powder works are on the point, and about 2 miles back of it are numerous oil tanks. The elevated tank at the powder plant about 3.5 miles eastward of Pinole Point is prominent. A wharf is located here. A pleasure fishing pier is located at **Lone Tree Point,** 4.6 miles easterly of Pinole Point. **Oleum,** on **Davis Point,** is an oil town. There are many prominent oil tanks, painted in pastel colors, on the hills back of the town. A T-shaped wharf, which is frequently used by oil tankers, extends out to deep water. A depth of 32 feet is available at the outer face of the wharf. Lights are privately maintained on the outer ends of the wharf, and white lights are shown at night along the trestle leading to the wharf.

Selby, a smelting town a mile eastward of Oleum, is distinguished by a high concrete stack.

A shallow channel, on the western side of San Pablo Bay 3.6 miles northerly of Point San Pedro, leads to Hamilton Air Force Base. The channel is southward of an entrance light and a line of daybeacons.

Petaluma River enters San Pablo Bay on the northwest side. The city of **Petaluma,** 12 miles above the mouth, is the center of an extensive poultry and egg industry. Large quantities of feed and petroleum products are shipped in, and fruit, poultry, and eggs are shipped out.

The Federal project depth of 8 feet through a marked dredged channel in the bay to Petaluma is usually maintained. The least clearances over Petaluma River are: drawbridges, 4 feet; fixed bridges 70 feet; and power cables, 70 feet.

A **danger zone** is in the eastern part of San Pablo Bay adjacent to the westerly shore of Mare Island; limits and regulations are given in **204.215,** Chapter 2.

Chart 5525.—Mare Island Strait, at the mouth of the Napa River, is between the mainland and **Mare Island.** South Vallejo and Vallejo are on the eastern side of the strait and the Mare Island Naval Shipyard is on the western side, about 2 miles above the southern entrance. In

January 1963, depths of 37 to 20 feet were in the channel to the first bridge, 2.9 miles above the entrance. Channel depths between the first and second bridges are 19 to 30 feet, but there are several shoal spots covered 13 to 18 feet.

Notice.—Ships destined for the Naval Shipyard, Mare Island, should await arrival of a Navy pilot at Carquinez Strait. The waters around Mare Island are included in a **restricted area**; limits and regulations are given in **207.640,** Chapter 2.

A power cable crossing lower Mare Island Strait between South Vallejo and Mare Island has a clearance of 155 feet. If the clearance between the masthead and the cable is less than 10 feet or if the clearance is not known, vessels shall not move under the cable without authority from the pilot.

Carquinez Strait Light (38°04.2′ N., 122°14.6′ W.), 40 feet above the water, is shown from a white frame tower on a dwelling at the end of the jetty on the eastern side of the entrance to Mare Island Strait; a fog signal is at the light.

South Vallejo, on the eastern shore of Mare Island Strait inside the entrance, is the terminal of a railroad connecting interior northern points. A large flour mill is southward of the railroad wharf, and lumber wharves to northward are prominent in entering. The flour mill wharf has 30 feet alongside and 28 feet can be carried from the entrance to this point with local knowledge. From 10 to 21 feet can be taken alongside the other wharves, depending on the locality.

Vallejo, 1 mile above South Vallejo, is of little commercial importance. The city supplies a large amount of fresh provisions to the Naval Shipyard and affords residences for employees and others attached there. It is also a distributing point for a considerable agricultural area in its vicinity. The shipyard, on the western side of Mare Island Strait, has drydocks and extensive facilities for repairing and building vessels of all sizes.

The Vallejo-Mare Island Causeway and drawbridge connects Mare Island with the city of Vallejo at the northern end of the Naval Shipyard. It has a bascule span with a clearance of 13 feet. At Sears Point, 1 mile above Vallejo, a highway bridge across the strait has a bascule span with a clearance of 11 feet. In 1962, a fixed highway bridge was under construction just north of the existing bascule bridge. Drawspan regulations are given in **203.712,** Chapter 2. If practicable, approach the bridges only when running against the current. No passage should be attempted during periods of peak flood or ebb current.

Chart 5533.—Napa River, the continuation of Mare Island Strait above the Naval Shipyard, is used by barges and some light-draft vessels. Traffic on the river consists of sand, gravel, crushed rock, gasoline, residual fuel oil, and some electrical machinery.

In 1962 the controlling depths in Napa River were (distances above the Vallejo-Mare Island Causeway Bridge): 15 feet from the entrance to Goodluck Point, 5 miles; thence 8 feet to Dutton Landing, 6.8 miles; thence 5 feet to Rocktram, 10.3 miles; and thence 4 feet to **Napa,** 13 miles.

The railroad bridge across Napa River just above Dutton Landing has a swing span with a clearance of 5 feet. The channel through the bridge crosses from one bank to the other causing a hazardous condition, particularly for downbound loaded barges, because the direction of the ebb current is as much as 50° from the axis of the channel.

Near **Imola,** 12 miles above Vallejo-Mare Island Causeway Bridge, the highway bridge crossing the river has a lift span with clearances of 25 feet down and 60 feet up. The two fixed bridges in Napa have a minimum width of 47 feet and a clearance of 10 feet. The minimum clearance of the power cables crossing the river below Napa is 125 feet, and in Napa, 40 feet.

Gasoline, diesel oil, water, and some other supplies can be obtained at several places along Napa River. A marine railway near Cuttings Wharf, 8 miles above the Vallejo-Mare Island Causeway Bridge, can haul out boats up to 50 feet in length; hull and engine repairs can be made. A 10-ton portable lift is available.

Chart 5534.—Six-mile long **Carquinez Strait** connects San Pablo and Suisun Bays. For the first 3.5 miles it is a little less than 0.5 mile wide, and then widens to about a mile. It is deep throughout with the exception of a small stretch of flats on the northern shore, and a small shoal area in the bight on the southern shore near the eastern end. There are several small settlements on both shores. Limits and regulations of anchorage areas are given in **202.224,** Chapter 2.

The **California State Maritime Academy** and pier are in **Morrow Cove,** on the northern shore of the western entrance to the strait.

Twin fixed highway bridges cross the strait at **Semple Point.** The channel on each side of the center pier is 1,000 feet wide; the clearances are 144 feet through the north span and 134 feet through the south span. Fog signals are sounded at the bridges; an aero light is atop the center pier.

Power cables cross the strait 0.3 mile west of the bridge and 1.2 miles east of it; the minimum clearance is 179 feet.

Crockett, on the south shore just east of the bridge, is built around a large sugar refinery. The wharves accommodate the deep-draft vessels that discharge sugar from Hawaii. Depths alongside are 35 feet or better.

Chart 5574.—A light and fog signal are off the northwestern extremity of a wharf in ruins on the south shore of Carquinez Strait, 1.5 miles eastward of the Carquinez twin bridges; another light and fog signal are offshore at **Port Costa,** 0.6 mile to the eastward. An oil wharf with deep water alongside is on **Point Carquinez,** on the south side of the strait 3 miles eastward of the Carquinez twin bridges. A brickyard with a wharf and other facilities in ruins is about 0.2 mile above the oil wharf.

A T-wharf, a mile eastward of Point Carquinez, extends out to deep water.

There are several wharves extending out to deep water at **Martinez,** 2 miles southeastward of Point Carquinez. The shorter and westernmost pier is in poor condition and not used. The longer pier is used by light-draft vessels, fishermen, and yachts. An inactive ferry slip is on its western side.

A yacht harbor, on the eastern side of the long pier, is protected by a breakwater; depths of about 10 feet are inside the harbor. A harbormaster assigns berths. Available supplies include gasoline, diesel oil, water, and marine hardware. A marine railway can haul out boats up to 40 feet in length; hull and engine repairs can be made.

Just to the eastward of Martinez, are two oil piers extending out to deep water; depths of about 35 feet are at their faces. The piers are marked by lights and fog signals.

Benicia is on the northern shore at the eastern end of Carquinez Strait. The U.S. Army reservation and arsenal are at the eastern end of the town where a **restricted area** extends up to 500 yards offshore; limits and regulations are given in **207.640**, Chapter 2.

Two bridges cross Carquinez Strait at the eastern end from **Army Point to Suisun Point.** The fixed highway bridge has a clearance of 135 feet over Suisun Point Reach; the railroad lift bridge has clearance of 70 feet down and 135 feet up over that channel. **Bulls Head Point,** just east of the south end of the bridge, shows as a 100-foot rounding hill with a prominent high brick stack on it.

An oil wharf extending across the flats at **Avon,** 1.5 miles eastward of the Suisun Point bridges, has depths of 35 feet alongside the channel face. Lights and fog signals are on the outer ends of the wharf.

Chart 5534.—Suisun Bay is a broad shallow body of water with marshy shores and filled with numerous marshy islands, many of which have been reclaimed and are now under cultivation. It is practically the delta of the Sacramento and San Joaquin Rivers which empty into the eastern part of the bay. Two narrow winding channels lead to the mouths of the rivers. They are marked by buoys, daybeacons, and lights. The rivers and the channels near the mouths have been improved by the Government to increase the depth, remove obstructions, and provide relief during freshet seasons. A Federal project provides for a main channel 30 feet deep through the bay to the San Joaquin River. The channel is maintained at or near project depth. The bay is used by many light-draft vessels having local knowledge. Strangers should take a pilot if bound above Benicia. Limits and regulations for anchorage areas in Suisun Bay are given in **202.224**, Chapter 2.

Suisun Slough, emptying into the northwestern side of Suisun Bay 5.5 miles northward of Benicia, has a controlling depth of about 6 feet to **Suisun City,** 12 miles above the entrance. The mean range of tide is about 5 feet. Traffic on the slough includes gasoline, jet fuel, and residual fuel oil. The power cable across the slough just south of Suisun City has a clearance of 110 feet.

A **restricted berthing area** for Maritime Administration Reserve Fleet vessels is along the west side of Suisun Bay; limits and regulations are given in **207.900,** Chapter 2. Drawbridge regulations for minor tributaries of Suisun Bay are given in **203.713,** Chapter 2.

Chart 5575.—Seal Bluff Landing, 2.5 miles eastward of Avon Pier, is the site of a former shipyard. The ruins of a lumber wharf are just eastward of the landing. Three large Government piers are along the waterfront of **Port Chicago,** and the area is closed to navigation. Limits and regulations of the **restricted area** along the waterfront of Port Chicago are given in **207.640,** Chapter 2.

Chart 5576.—Pittsburg, 12 miles eastward of Suisun Point bridges, is a manufacturing city with an increasing amount of waterborne commerce. The Pacific Gas and Electric Company oil pier 0.3 mile westward of New York Point, and the M.&R. Terminal, the U.S. Steel Company Wharf, and the Dow Chemical Company Wharf on the southerly side of New York Slough have depths up to 35 feet alongside. Fuel, water, and marine hardware for small boats are available at the yacht basins southward of New York Point. A marine railway can haul out boats up to 65 feet in length; hull and engine repairs can be made.

Antioch, on the south side of San Joaquin River 16 miles eastward of Suisun Point bridges, is a manufacturing city with an increasing amount of waterborne commerce. The Kaiser Gypsum Company Wharf and the Crown-Zellerbach Paper Company Wharf, eastward of the city, have depths of 30 feet or more alongside. The Fulton Shipyard has a marine railway that can haul out vessels up to 500 tons for general repairs; marine hardware is available.

Chart 5527.—San Joaquin River rises in the Sierra Nevada, flows 275 miles in a westerly direction, and enters Suisun Bay through **New York Slough.** The winding river is navigable for deep-draft vessels to Stockton. The water is generally fresh at Antioch. The mean range of tide is about 3 feet from the entrance to Stockton. Major floods in the river valley may occur from November to April, caused by intense general storms of several days duration. At the mouth of the river an ordinary flood will cause a rise of 8 feet and an extreme flood a rise of 10 feet in the river level. At Stockton, ordinary flood will cause a rise of 8.5 feet, and extreme flood a rise of 13.5 feet in the river level. The delta of the river is formed of many marshy islands intersected by sloughs and channels. The islands are reclaimed tule and cattail marshes which have been converted to agriculture. **Tule** is the name given to a tall aquatic plant growth similar to bulrush. Bordering the river are levees which are 12 feet or more higher than the land behind them.

Reports of gage heights of the San Joaquin River delta can be obtained from the Sacramento Weather Bureau Office at any time. The information is published in the Sacramento Bee and, in addition, is reported on radio

broadcasts from stations KFBK whenever the gage heights are of sufficient magnitude to be of general interest.

Information on gage heights can also be obtained from the State Department of Public Works, Division of Water Resources, Public Works Building, Sacramento.

A Federal project provides for a 30-foot channel from the mouth of the San Joaquin River to Stockton, and a channel 9 feet deep in Mormon Channel to the head of navigation at Washington Street. The project also provides for suitable passing and turning basins. Corps of Engineers project maps for June 1961 show that the controlling depths in the channels were: 30 feet to Mormon Channel, thence 22 feet to Edison Street, thence 9 feet to the head of navigation at Center Street; 9 feet in Fremont Channel and McLeod Lake; 9 feet in Mormon Channel to Main Street, and thence 6 feet to the head of navigation at Washington Street.

Limits and regulations for **anchorage areas** in the San Joaquin River are given in **202.224,** Chapter 2.

Rules and regulations governing maximum speed, passing, right-of-way, collision, and wrecks in the San Joaquin River are given in **207.640,** Chapter 2.

Antioch Bridge, 3 miles eastward of Antioch, has a lift span with clearances of 78 feet down and 143 feet up at **mean lower low water during lowest river stages.** Power cables over the main channel of San Joaquin River from the mouth to the turning basin at Stockton have a minimum clearance of 125 feet.

There are small-boat facilities on the south side of San Joaquin River on both sides of Antioch Bridge. Available supplies include gasoline, diesel oil, water, marine hardware, and groceries. The largest marine railway can haul out boats up to 55 feet in length; hull and engine repairs can be made.

The main channel in San Joaquin River to Stockton is marked by lighted buoys, lights, and lighted ranges. At **Mandeville Cut** and **Venice Cut,** 15 miles above Antioch Bridge, the river still follows its old channel and violent sheers are experienced if the navigator is not prepared to meet the river current when passing from the cuts into the river and from the river into the relatively quiet waters of the dredged channel.

Stockton, 28 miles above Antioch Bridge, is in the center of the fertile San Joaquin Valley. The deep-draft harbor is near the westerly city limits.

Tides and currents.—The mean range of tide is 3.1 feet and the tidal current is negligible.

Pilotage.—River pilots, commissioned by the Port of Stockton, may be obtained through the office of the Port of Stockton or through agents.

Towage.—It has not been necessary for towage companies to operate at this port because all vessels operate under their own power. A tugboat of 410 horsepower is available.

Quarantine is enforced in accordance with regulations of the U.S. Public Health Service.

Customs matters are handled through an agent whose office is located at Shed 8 in Stockton.

Wharves.—There are 11 berths for large vessels with depths of 32 feet maintained alongside by the port. The wharves for deep-water shipping are on the southerly side of the main channel. Modern rapid loaders and cargo-handling machinery, including two gantry cranes each with a capacity of 30 tons, are available. There is a large grain elevator at dockside and the port maintains extensive warehouses on the wharves and nearby; all are connected by its own belt-line railroad.

Supplies may be had in any quantity, and fresh water is piped to the wharves. Gasoline and oil are available to small craft, but bunkering of large vessels must be done at the oil terminals in the San Pablo Bay area.

Repairs.—Some dockside facilities are available here, but the nearest marine railway is the one of 500 tons capacity at Antioch. Major repairs to large vessels must be done at drydocks in Oakland and San Francisco.

San Joaquin River above Stockton.—From its junction with Stockton Channel, the river has a controlling depth of about 3 feet for 70 miles to Hills Ferry, and is used only by small pleasure craft, fishermen, and an occasional small barge. The only facilities available are those dispensing gasoline, lubricants, and water at a few points. Navigation above the Southern Pacific Railroad bridge near Lathrop, 14 miles above Stockton, is impracticable in the low stages after June. The river is tidal as far as Mossdale, 15 miles above Stockton. At the San Joaquin Bridge, 28 miles above Stockton, the ordinary flood range is 17 feet and the extreme flood is 21 feet. At Hills Ferry the ordinary flood is 12 feet and extreme flood is 16 feet.

Bridges.—More than 15 bridges cross San Joaquin River between Stockton and Hills Ferry; drawspan regulations are given in **203.714,** Chapter 2. The drawbridges have a least clearance of 17 feet and the fixed bridges a least clearance of 21 feet at **mean lower low water during lowest river stages.** The first fixed bridge is 28 miles above the junction with Stockton Channel.

The tributaries of the San Joaquin River are the feeder rivers, sloughs, and canals which flow into or connect with it. The principal waterways are described in sequence as the river is ascended. **Bridge clearances are at mean lower low water during lowest river stages;** drawspan regulations are given in **203.714,** Chapter 2.

Bordering the various waterways are levees which are 12 feet or more higher than the land behind them. The levees are built up from dredged material taken from the adjacent waterway, and due to settlement of the levees, dredging has been done periodically to keep the top at height and grade. As material is needed for levee work, the dredge pays more attention to the requirements of the levee than to the depth of the channel for navigation purposes. This leaves an uneven bottom. The tops of the levees for the most part have dirt roads. Tule is often found growing on the channel side of the levees.

Many of the tributaries are used for navigation, either by pleasure craft or by commercial vessels. The pleasure craft draw from 1½ to 4 feet, while tugs and barges draw from 4 to 9 feet. There are very few wharves on these sloughs. The boats and barges using the channels make fast alongside the levee at practically any place desired.

Usually landings are made at various sheds located on the levee.

Caution.—The river and its tributaries are crossed by ferries which are guided by cables fastened to shore, and sometimes propelled by a cable rig attached to the shore. Caution must be used not to navigate in the vicinity of the ferry lane when the ferry is underway because of the danger of fouling the cables.

Threemile Slough, 5.8 miles above Antioch Bridge, joins the Sacramento River at the north end of **Decker Island.** The slough is a route frequently used by river steamers making passage between Sacramento and Stockton. Near the junction with the Sacramento River is a highway lift bridge with clearances of 16 feet down and 111 feet up. The power cable east of the bridge has a clearance of 108 feet.

Mokelumne River, one of the principal tributaries of the San Joaquin River, rises in the Sierra Nevada and empties into it 11.8 miles above Antioch Bridge. The river separates, 3.5 miles above its mouth, into two branches, the **North Fork** and the **South Fork.** The forks continue in a northerly direction and rejoin 11 miles north-northeastward from the mouth. The river then describes a semicircular route for 7 miles to the northward and eastward to the head of navigation at the Galt-New Hope bridge.

Corps of Engineers project maps for June 1961 show the following controlling depths for Mokelumne River: 12 feet from the mouth to the lower junction of the North and South Forks; thence 7 feet by North Fork to Snodgrass Slough; thence 2 feet to upper junction of the North and South Forks, by North Fork; 7 feet from the lower junction by South Fork to the upper junction; and thence 2 feet to the Galt-New Hope bridge.

Drawspan regulations for the swing and removable span bridges crossing Mokelumne River between the entrance and Galt-New Hope fixed bridge at Thornton are given in **203.714,** Chapter 2. The minimum clearance of the drawbridges is 11 feet. Power cables have a minimum clearance of 110 feet.

At low-river stages the range between mean lower low water and mean higher high water at the mouth is 4 feet, with extreme tidal range of 5 feet; there is no tide at the upper end, just above Galt-New Hope bridge. Ordinary flood fluctuation is 8 feet at the mouth and 17 feet at the upper end.

Freight is handled at small wharves, landings, or on the banks at various points.

Georgiana Slough enters Mokelumne River about 3 miles above the mouth, and connects that river with Sacramento River at Walnut Grove. There is deep water the entire length of the slough. River vessels formerly used the slough in making the run from Sacramento to Stockton, but to avoid the snags and sharp turns they now favor the route through Threemile Slough.

The minimum clearance of the drawbridges crossing Georgiana Slough is 13 feet; drawspan regulations are given in **203.715,** Chapter 2. Power cables have a minimum clearance of 125 feet.

Old River leaves San Joaquin River 47 miles above the mouth and re-enters 13 miles above Antioch Bridge. It is the most westerly branch of the interconnecting tidal channels into which San Joaquin River divides in crossing its delta. Old River has many sloughs and canals which connect with Middle River to the eastward.

Corps of Engineers project maps for June 1961 show that the controlling depths in Old River were: 10 feet for 10 miles from the mouth to Orwood; thence 10 feet for 9 miles to the lower end of Grant Line Canal; thence 7 feet for 9 miles to the Holly Sugar Factory near Tracy; and thence 5 feet to the head of Old River in San Joaquin River.

The minimum clearances of the bridges crossing Old River are: drawbridges, 10 feet; fixed bridges, 18 feet. Power cables as far as Orwood have a minimum clearance of 110 feet.

The tidal range between mean lower low water and mean higher high water at the head of Old River is about 2 feet, and at its mouth about 4 feet; ordinary flood fluctuations are 15 feet and 5½ feet, respectively, and extreme flood fluctuations are 19 feet and 8 feet, respectively.

The Atchison, Topeka, and Santa Fe Railway has a warehouse and wharf at Orwood for transfer of farm produce from boat to rail. The Phillips cannery at Orwood has similar facilities. The Holly Sugar Company refinery and terminal near Tracy has a large wharf and an unloading basin; a passing basin is about 0.5 mile downstream from the terminal.

Middle River enters the San Joaquin River 15.3 miles above Antioch Bridge. The river and connecting channels are a part of a complicated network of tidal canals, some natural and some artificial, in the delta of the San Joaquin River. One of the principal channels, Middle River is a by-channel of the San Joaquin River leading Old River above the city of Stockton and rejoining the San Joaquin River about 13 miles below the city.

Corps of Engineers project maps for June 1961, show a controlling depth of 6 feet in Middle River to the Williams highway bridge, 19.3 miles above the mouth.

The least clearance of the drawbridges crossing Middle River below the Williams bridge is 12 feet; drawspan regulations are given in **203.714,** Chapter 2. Power cables as far as the town of Middle River have a minimum clearance of 110 feet.

The mean range of tide in Middle River is about 3 feet during stages of extreme low water.

A large wharf with warehouse and rail connection is at the town of **Middle River,** 8.5 miles above the mouth.

Charts 5527, 5528.—Sacramento River rises in the Trinity Mountains in north central California, flows southerly for 325 miles, and enters Suisun Bay on the north side of **Sherman Island.** Deep-draft vessels follow the lower Sacramento River to Cache Slough, 1.5 miles above Rio Vista Bridge, thence through a deepwater ship channel to Sacramento, a distance of 37 miles above the mouth of the river. Barges and other small craft also use Sacramento River all the way to Sacramento, a distance

of 50 miles. Above Sacramento, small craft go to Colusa, 125 miles above the mouth, but there is no regular navigation above this point.

Channels.—**Sacramento Ship Channel** extends from Suisun Bay through lower Sacramento River, Cache Slough, and a 22-mile land cut to a triangular harbor and turning basin at the Port of Sacramento. A barge canal with navigation lock connects the channel with the Sacramento River at Sacramento. Controlling dimensions follow: ship channel, 30 feet deep, 200 to 300 feet wide; barge canal, 13 feet deep, 120 feet wide; navigation lock, 600 feet long, 86 feet wide, 13 feet deep. **Navigation regulations** are given in **207.640,** Chapter 2.

The controlling depth of the river route is about 10 feet. Above Sacramento, the controlling depth is about 6 feet to Colusa.

Bridges.—The vertical-lift highway bridge across the Sacramento Ship Channel just above Rio Vista has clearances of 15 feet down and 140 feet up at **mean lower low water during lowest river stages.** The highway-railroad bascule bridge across the barge canal just west of the lock at Sacramento has a clearance of 8 feet.

The minimum clearance of the power cables across the Sacramento Ship Channel is 140 feet.

Clearances of bridges across the shallow route of the Sacramento River above Rio Vista Bridge are given with the description of the river; refer to **203.716,** Chapter 2, for **drawspan regulations.** The clearances below Sacramento are at **mean lower low water during lowest river stages.**

The minimum clearance of the power cables over the Sacramento River below Sacramento is 110 feet.

Tides and currents.—At low-river stages the mean range of tide is 3.2 feet at the entrance to Sacramento River and 2.3 feet in the river at Sacramento; at other stages the tide is negligible.

Currents in Sacramento River depend on the river stage. During high-river stages there is little or no flood current and the ebb current is strong to Sacramento. During the dry season a flood current can be carried to Paintersville and from there slack water to Freeport, 30 and 41 miles above the mouth, respectively. At times of extreme low-river stages, flood current may be evident as far as Sacramento. Local knowledge is required to estimate current conditions for a particular time.

Major floods in the Sacramento River valley usually occur from November to April and are generally caused by intense general storms of several days' duration, the runoff from which may be augmented by the melting of snow in the mountains. At the mouth of the river an ordinary flood will cause a rise of 8 feet and an extreme flood a rise of 10 feet in the river level. At Sacramento, ordinary flood will cause a rise in the river level of 20 feet and extreme flood, a rise of 30 feet.

Reports of gage heights of the Sacramento River can be obtained from the Sacramento Weather Bureau Office at any time of the year. The information is published in the Sacramento Bee and, in addition, is reported on the radio broadcast from station KFBK whenever the gage heights are of sufficient magnitude to be of general interest. Information on gage heights can also be obtained from the State Department of Public Works, Division of Water Resources, Public Works Building, Sacramento.

The upper 20 miles of Sacramento Ship Channel are free of river current and flood waters.

Routes.—The deep-draft channel to the Port of Sacramento through Sacramento Ship Channel is marked with navigational aids.

The shallow-draft route continues in Sacramento River from 1.5 miles above Rio Vista Bridge to Sacramento, and for the most part is marked by leading lights.

From **Ida Island** for a distance of 3.5 miles upstream there are shifting shoals. After passing Ida Island, work gradually over to the southern shore and keep within 200 feet or less of it until near the bridge above Isleton, then gradually work over to the western half of the channel and favor that side around the next bend. From this point to Clarksburg the channel is clear, and midchannel courses may be followed favoring the falling tide bends. At Clarksburg favor the eastern shore a little until just past the town, then swing into midchannel again. From just below Freeport the channel is rather shoal and wing dams have been built at several places to scour out the channel. These are covered at high-water stages and may be struck if the shore is approached too closely. By favoring the ebbtide bends no trouble should be encountered from here to Sacramento.

Note.—Care should be exercised at all times to keep clear of the levees, as most of them are faced with rock which may damage vessels that drag along them.

Pilotage.—The River Lines, acting for the city of Sacramento, will furnish pilots on call between Sacramento and other points on the Sacramento River, San Joaquin River, and San Francisco Bay area.

Towage.—Tugs up to 1,050 horsepower are available.

Chart 5527.—**Rio Vista,** 10.5 miles above the mouth of the Sacramento River, is the most important town commercially below Sacramento. Fuel, marine hardware, and groceries may be obtained.

Isleton, on the south bank 15 miles above the mouth of the river, has an oil landing where gasoline and other petroleum products, and supplies in moderate quantities may be obtained. A highway bridge with a double-bascule span across the river 0.7 mile above Isleton has a clearance of 18 feet.

Chart 5528.—**Walnut Grove,** 24 miles above the mouth of Sacramento River, is at the junction with Georgiana Slough. Gasoline, oils, and supplies may be obtained in moderate quantities. The river is crossed here by a highway bridge with a double-bascule span having a clearance of 21 feet. Five miles above Walnut Grove at the small village of **Paintersville,** a highway bridge with a double-bascule span across the river has a clearance of 24 feet.

Courtland, 31 miles above the mouth of the river, has supplies in moderate quantities; gasoline and oils may be obtained from an oil company's landing.

At Clarksburg, 37.5 miles above the mouth of the river,

two oil companies have landings; this is a distributing point for petroleum products.

Freeport, 41.5 miles above the mouth of the river, has gasoline, oils, and groceries in small quantities. The highway bascule bridge at Freeport has a clearance of 30 feet.

Two bridges cross at Sacramento. The Capitol Street bridge is a railway and highway vertical-lift bridge with clearances of 38 feet down and 128 feet up. The Eye Street bridge is a railway and highway swing bridge with a clearance of 33 feet.

A paved highway between Antioch and Sacramento runs along the levee of the river for nearly its entire distance.

Sacramento, the State capital, is the head of navigation for most of the shipping on the river, and is a distribution and transportation center for northern California and parts of Nevada and Oregon. The **Port of Sacramento,** at the head of the deep-water channel, is an important point for interchange of cargo between rail, highway, and water transportation.

Wharves.—There are five berths for deep-draft vessels and two slips for barges at the Port of Sacramento terminal. Modern rapid loaders and cargo-handling machinery, including conveyor systems for handling bulk grain and rice direct from landside storage, are available. Open and covered storage areas are provided.

Wharves along the shallow part of the Sacramento River have ample depths alongside to accommodate vessels able to negotiate the river. There are transit sheds and storage warehouses. Nearly all freight is handled by shipside loading.

Supplies.—Groceries and marine hardware may be had in any quantity; water is piped to the terminal wharves. Fuel for large vessels is available from barge at the Port of Sacramento; bunkering is also done at the oil terminals in the San Pablo Bay area. Small craft can obtain gasoline and diesel fuel along the river fronting Sacramento.

Repairs.—Some dockside repairs can be made, but major repairs to large vessels are made at the drydocks in Oakland and San Francisco.

A skidway, on the west side of the Sacramento River at Sacramento, has a depth of water over the foot of about 3½ feet at extreme low water. Flat-bottom river craft up to 6-foot draft can be handled on the marine ways.

Charts 5529, 5530.—Above Sacramento the prevailing flood conditions are as follows: At Verona at the junction of Feather River, 70 miles above the mouth, 20 feet at ordinary floods and 24 feet at extreme floods; at Colusa, 125 miles above the mouth, 25 feet at ordinary floods and 32 feet at extreme floods.

Between Sacramento and Colusa are numerous warehouses and small landings. Freight is also handled on the bank.

The minimum clearance of the swing and bascule span bridges over the Sacramento River between Sacramento and Colusa is 25 feet at **low water.** Drawspan regulations are given in **203.716,** Chapter 2. The minimum clearance of the power cables across the river is 110 feet.

Feather River rises in the Sierra Nevada and empties into Sacramento River at **Verona,** 18 miles above Sacramento. The river has been improved by snagging and the construction of wing dams at **Marysville,** 26 miles above the mouth. The controlling depth is usually 3 feet from about February 15 to June 15. Ordinary flood fluctuation is 20 feet and extreme flood fluctuation is about 25 feet. With the exception of several small privately owned landings, all loading is handled on the banks. There has been no commercial navigation on the Feather River in recent years. A highway bridge with removable span, 8.1 miles above the mouth, has a clearance of 37 feet at low water. The clearance of the fixed highway bridge near Marysville, 24.8 miles above the mouth, is 44 feet at low water.

8. SAN FRANCISCO BAY TO POINT ST. GEORGE, CALIFORNIA

Charts 5502, 5603.—From Point Reyes, the coast trends in a general northerly direction for 10 miles as a broad white sand beach backed by high grassy sand dunes, and then curves northwestward for 6 miles in high yellow cliffs, terminating in **Tomales Point.** The large white building at the radio station, 7 miles northeastward of Point Reyes, is prominent.

Bodega Bay, a broad opening between Tomales Point and Bodega Head, affords shelter from northwesterly weather at its northern end, but is dangerous in southerly or westerly weather. The summit of **Bodega Head** is rounding and grassy, with steep rocky cliffs on the southern and western ends. Low **Bodega Rock** and foul ground extend from 0.2 to 0.7 mile southeastward of the south face of Bodega Head.

Lighted buoys mark the entrance to Bodega Bay. In good weather small boats having local knowledge sometimes use the passage between Bodega Head and Bodega Rock, but the passage is dangerous during periods of heavy ground swells because of the combers.

Boundary lines of inland waters.—The lines established for Bodega and Tomales Bays are described in **82.131,** Chapter 2.

Tomales Bay enters the southern part of Bodega Bay eastward of Tomales Point, and extends southeastward for 12 miles with an average width of 0.5 mile. The channel with depths of 4 to 8 feet is marked by buoys for about 4 miles to deeper water inside the bay. The entrance bar is dangerous and should not be attempted by strangers. A 6-knot current may be encountered on a spring tide at the entrance to the bay.

Fish, clams, and oysters are taken from Tomales Bay by commercial and sport fishermen, and moved to San Francisco by truck. There are several small-craft repair yards where ordinary repairs can be made; most boats go to the yards in San Francisco Bay for major work. Long piers used by sport fishermen extend out into the bay at several places. Gasoline, fishing supplies, and groceries can be obtained.

Bodega Harbor, in the northern part of Bodega Bay, is an important commercial fishing base and in season an active sports fishing and recreation harbor. During salmon season more than 500 fishing craft either anchor just outside in the shelter of the northerly part of the bay, or inside at the moorings which ordinarily accommodate about 200 boats.

A marked dredged channel, protected by entrance jetties, leads from Bodega Bay to the facilities at the town of **Bodega Bay.** The project depth of 12 feet is generally maintained to the wharves and docks. Gasoline, diesel oil, lubricants, ice, water, some marine hardware, fishing supplies, and groceries are available.

Chart 5502.—The coast from Bodega Head for 57 miles to Point Arena trends in a general northwesterly direction. There are some dangers, but they do not extend over a mile offshore, and in thick weather the 30-fathom curve may be followed with safety. In the summer the rocks are generally marked by kelp which extends in some cases to the 10-fathom curve, but during the winter gales much of the kelp is torn away.

In clear weather the mountains may be readily seen, and at times are visible when the lower land is shut in by haze or fog. In thick weather soundings should be taken frequently, as the currents are extremely irregular both in direction and velocity.

Protection from the prevailing northwesterly winds of summer may be had at several places, but there is no shelter from the winter winds, which are usually accompanied by a heavy westerly swell.

Northward of Bodega Head the cliffs are about 200 feet high for 2 miles, and then are succeeded by a broad sand beach 2 miles long backed by sand dunes 120 feet high. From this point the coast northward consists of abrupt rocky cliffs, broken by gulches, to the mouth of the Russian River, 10 miles northward of Bodega Head.

Numerous rocks, 20 to 130 feet high, are within 0.3 mile of the shore, but some extend as much as a mile offshore. **Gull Rock,** 100 feet high, is 1.7 miles southeastward of the mouth of Russian River and 0.3 mile offshore. About 0.5 mile northwestward of Gull Rock and 400 yards offshore is a large arched rock, 85 feet high, with a flat top. This is the largest arched rock on this part of the coast.

Duncans Landing, 6 miles northward of Bodega Head, is a fair small-boat landing in northwesterly weather.

The spit making out from the southern point of **Russian River** has been partially reinforced by a short rock jetty, but the mouth of the river is closed by a shallow bar. The bold sharp point immediately to the southward of the river appears as an island from the southward; it is connected to the mainland by a roadway. Many summer resorts are on the shores of Russian River; at the settlement of **Jenner** there is a landing where gasoline and water may be obtained.

Ross Mountain, 3 miles inland and northward of Russian River, is the highest knob on the ridge. A few clusters of trees are near its summit; the slopes are bare of trees and the gulches are wooded.

From Russian River for 6.5 miles to Fort Ross Cove the coast is high, consisting of bare steep spurs from Ross Mountain. **Sunken Reef** extends 0.8 mile from shore 4.5

miles northwestward of Russian River; it is marked by a buoy.

Fort Ross Reef, 5.7 miles northwestward of Russian River and nearly 1 mile southeastward of Fort Ross Cove, consists of pinnacle rocks 35 feet high, 600 yards offshore, and connected with the beach by a reef which is partially marked by kelp.

Fort Ross Cove, 15.5 miles northward of Bodega Head and 33 miles northward of Point Reyes, affords good shelter in northwesterly weather. The holding ground is poor and the anchorage is constricted by a rock that uncovers in the middle of the cove and a rock about 50 yards northward of it that is covered 14 feet. The cove is divided into two bights, the western one being slightly the larger. The anchorage is suitable for small vessels only, and if used by strangers should be entered with caution.

Fort Ross was first settled by the Russians in 1812, and the old Russian church is still standing. The buildings have been restored and the area is now a State Historical Monument. The landing facilities have been abandoned.

From Fort Ross Cove the coast extends northwestward and is nearly straight. It is bold and wooded to the crests of the hills which closely approach the coast, and is cut by numerous gulches and bordered by many inshore rocks. Several landings, practically all abandoned, are along this stretch of the coast. The 30-fathom curve is at an average distance of 0.7 mile off shore from Fort Ross Cove for 20 miles to near Gualala River.

Salt Point, 5 miles northward of Fort Ross Cove, is 35 feet high, very rocky, and bare of trees; it is bordered by outlying rocks for 200 yards. The 30-fathom curve is less than 0.5 mile off this point.

Fisk Mill Cove, 2.5 miles northward of Salt Point, affords fair shelter for small vessels in northwesterly weather. The bottom is rocky but there are no hidden dangers.

Horseshoe Point, 3 miles northward of Salt Point, is a cliff 180 feet high, with a depression of 60 feet immediately behind it. It is bare of trees; the summit is marked by several projecting rocks.

From Horseshoe Point the coast trends northwestward for 12.5 miles to Gualala River, and consists of cliffs, about 60 feet high, bordered by numerous outlying rocks. The tree line is from 0.1 to 0.5 mile back from the edge of the cliffs.

Fisherman Bay, 26.5 miles northwestward of Bodega Head, is a fair shelter for small craft in northwesterly weather. There are two covered rocks marked by kelp 350 yards off the southern point of the bay. There is a general store at the village of **Stewarts Point** on the north side of the bay.

A 0.5-mile long sand beach backed by prominent high dunes is 33 miles northwestward of Bodega Head.

Gualala Point, 16 miles southeastward of Point Arena and 1 mile southward of Gualala River, is 42 feet high, about 300 yards offshore, and connected with the bluff by a rocky reef covered with sand. Sand dunes extend behind the bluff for 600 yards.

Local magnetic disturbance.—Differences of as much as 8° from normal variation have been reported near Gualala Point; and a difference of as much as 4° near Saunders Reef.

Gualala River intersects the coast 15 miles southeastward of Point Arena. A long sand beach extends a mile southward from the mouth. The mills at **Gualala** and the white hotel building can be seen from the west and southwestward.

Robinson Reef lies northward of the mouth of Gualala River and 1.1 miles northward of Gualala Point. It consists of a cluster of 25 or more visible rocks about 600 yards offshore, with a covered rock 70 yards west-northwestward of the outer rock.

Bourns Landing is 1.5 miles northwestward of Gualala River. The anchorage here is exposed and can be used only in the summer. Local knowledge is necessary because of several covered rocks in the approaches. Lumber from the Gualala mills was formerly shipped from here.

Havens Anchorage, 12 miles southeastward of Point Arena and 4 miles northwestward of Gualala Point, offers shelter for small vessels from the prevailing northwesterly winds southward of Fish Rocks. The cove is constricted by rocks and ledges extending 250 yards southeastward from the western head. Strangers should approach the anchorage with caution. During the summer the anchorage is used extensively by fishing boats in northwesterly weather.

Fish Rocks, two rocky islets 4.2 miles northwestward of Gualala Point, are connected at low water with the shore and surrounded by numerous smaller rocks. The outer rock is 150 feet high and the inner 100 feet high and 100 yards offshore. A rock 40 feet high lies 175 yards southeastward of the outer rock.

Havens Neck, 145 feet high and prominent, is 0.6 mile northwestward of Fish Rocks. It is bare of trees and connected with the bluffs by a narrow neck.

Gualala Mountain, 5 miles inland northeastward of Havens Neck, is heavily wooded and prominent in clear weather. **Sail Rock,** 44 feet high, is a sharp, pyramidal rock 800 yards offshore, 2.8 miles northwestward of Fish Rocks. From off Point Arena it resembles a small vessel under sail. **Saunders Reef,** 4.5 miles northwestward of Fish Rocks, is 0.5 mile offshore. It shows several rocks that uncover and is well marked by kelp. Foul ground extends between it and the shore. A lighted whistle buoy is 0.4 mile southwestward of the outer rock and 7.5 miles southeastward of Point Arena.

Arena Cove, 2.5 miles southeastward of Point Arena, is a slight indentation affording shelter to small vessels in northwesterly weather. The southern head is a high yellow cliff that under favorable circumstances is visible for a considerable distance. A wharf in fair condition is at the head of the cove with 14 feet at its outer end. Water is piped to the wharf and fuel can be obtained by truck. A fishhouse is near the foot of the wharf. Some groceries may be had. A white lookout tower with a red roof on a steel structure is prominent. A lighted gong

691-231 O—63——10

buoy is 0.6 mile southwestward from the end of the wharf.

To enter, make the lighted gong buoy, then bring the end of the wharf to bear **074°** and stand in on this course. This leads about 150 feet southward of a rock covered 16 feet that lies 300 yards 264° from the end of the wharf. In thick weather during the summer in approaching the cove from northward or southward, the edge of the kelp may be followed, which will lead to within 300 yards of the lighted gong buoy. The town of **Point Arena** is on the highway a mile east of the landing.

A breaker is reported in a heavy southwesterly swell 0.8 mile west-southwestward of the northern point of Arena Cove, and scattered kelp extends almost out to that position.

Point Arena, 68 miles northwesterly of Point Reyes, consists of a long level plateau, diminishing in height to the end of the 60-foot high point. It is the first prominent point northward of Point Reyes. The point is bare of trees for about a mile from the shore.

Point Arena Light (38°57.3′ N., 123°44.4′ W.), 155 feet above the water, is shown from a 115-foot white cylindrical tower at the extremity of the point; a radiobeacon and fog signal are at the station. A Loran tower is 2 miles southward of the light. A reef that usually shows breakers extends about 0.6 mile northwestward from the extremity of the point.

Arena Rock, 1.4 miles northward of Point Arena Light, is covered 13 feet and shows a breaker except in very smooth weather. A covered rock which rises abruptly from deep water and breaks only in heavy weather is 200 yards northward of Arena Rock.

Caution.—Vessels approaching Point Arena from northward in thick weather are advised to keep outside the 40-fathom curve because Arena Rock is only 0.8 mile inside the 30-fathom curve and shoaling near it is abrupt.

Chart 5602.—From Point Arena the coast extends in a general north-northwesterly direction for 50 miles and then trends northwesterly for nearly 35 miles to Punta Gorda, thence north-northwesterly for 10 miles to Cape Mendocino. The southern portion is less bold and rugged than the northern portion, and the mountains are neither as high nor as close to the coast. The dangers are all included within the 30-fathom curve, and except for Blunts Reef and the other reefs in the vicinity of Cape Mendocino, do not extend more than a mile offshore. Several submarine valleys with depths greater than 50 fathoms come within 0.5 to 2 miles of the shore between Point Delgada and Cape Mendocino; the currents are irregular in this area.

From Cape Mendocino to Trinidad Head the coast trends in a north-northeasterly direction for 40 miles and, with the exception of the rocks off False Cape, the dangers are within 0.5 mile of the shore. The land is generally low with sandy beaches, broken by the mouths of the Eel and Mad Rivers and the entrance to Humboldt Bay. The only marked elevations northward of False Cape are Table Bluff and Buhne Point.

In clear weather the mountains are good landmarks and can frequently be seen when the lower land is obscured by fog or haze.

Between Point Arena and Cuffey Cove, protection from the prevailing northwesterly winds of summer may be had in a few places, but there is none from southward or westward.

From Point Arena the cliffs of the point extend 0.5 mile northeastward to the mouth of **Garcia River,** from which sand dunes and beaches extend northward for 4 miles. Beyond this point for 40 miles to **Ten Mile River Beach** the coast is rugged, with high, bold cliffs bordered by numerous outlying rocks.

Mal Pass is a steep gulch 5.2 miles northward of Point Arena; the bluffs on each side are nearly 280 feet high. **Red Bluff,** 8 miles northward of Point Arena, is a prominent reddish 200-foot high cliff. **Elk Rock,** 8.5 miles northward of Point Arena, is 95 feet high and 0.5 mile offshore.

Chart 5703.—**Nose Rock,** 10.3 miles northward of Point Arena and 0.7 mile offshore from Elk, is 24 feet high. **Casket Rock,** 700 yards northeastward of Nose Rock, is the outermost of three large rocks westward of a 150-foot cliff fronting the village of **Elk.**

Cuffey Cove, 11 miles northward of Point Arena, is a small anchorage affording fair shelter in northwesterly winds. **Cuffey Inlet,** just westward of the cove, is an excellent anchorage for small boats in northerly and westerly weather. Caution is necessary to avoid the many covered and visible rocks in the approaches to the cove and inlet. A small kelp-covered rock that uncovers lies near the center of the entrance to the inlet. The cove is covered with patches of kelp during most of the year.

From Cuffey Cove for 3 miles to **Navarro River,** the coast consists of cliffs 200 feet high, bordered by outlying rocks. Although the mouth of the river is nearly always closed by a bar with only 1 or 2 feet of water over it, there is fair shelter at the entrance from southwesterly winds. **Navarro Head,** 405 feet high, is on the northern bank of the river.

Chart 5711.—**Salmon Point,** the southern entrance point to **Whitesboro Cove,** 1.2 miles northward of Navarro River, is a treeless cliff 109 feet high. Detached rocks extend westward of the point for 0.2 mile, with **Bull Rock,** a covered ledge, usually showing a breaker 0.5 mile northwesterly of the extremity of the point. In a heavy swell there are breakers showing between it and the visible rocks off the point. Whitesboro Cove is rocky, exposed to northwest and west winds, and is seldom used as an anchorage.

Albion Cove, 16.5 miles northward of Point Arena, affords good shelter in northerly weather. The south point at the entrance rises to a knoll 179 feet high; low rocks extend nearly 500 yards westward of the point. The north point is a rocky islet 80 feet high lying close to the point which has the same elevation; both are bare. Small visible rocks lie 200 yards westward of the islet, and covered rocks, showing breakers in a moderate

swell, extend out more than 500 yards west-southwestward from it. The principal danger in the approach is a covered rock, usually showing a breaker, 250 yards southward of the islet. **Mooring Rock,** in about the middle of the cove, is 30 feet high and pyramidal in shape; small rocks extend from it to the north shore. A whistle buoy marks the entrance to the cove.

The village of **Albion** is on both high banks of **Albion River.** There are several small piers in the river serving the commercial and sport fishermen. Gasoline, diesel oil by truck, water, ice, and fishing supplies are available. Some groceries can be obtained. The river is crossed by a fixed highway bridge that has a clearance of 118 feet, 0.1 mile above the mouth.

Between Albion Cove and Colby Reef, breakers are seen in a heavy swell nearly 0.5 mile from shore; vessels should not approach closer than 1 mile.

Stillwell Point, 1.6 miles northward of Albion Cove, is a bold, sharp 190-foot cliff. A 141-foot high rocky islet lies close inshore on its northwestern side. A yellow slide is on the southern face of Stillwell Point. **Colby Reef,** 0.5 mile offshore westward of Stillwell Point, consists of a rocky patch covered 1½ fathoms. Numerous other dangers are just inside the 20-fathom curve along this stretch of coast.

Little River, 19 miles northward of Point Arena, offers shelter in the entrance cove. The reefs and rocks surrounding the cove are well marked by kelp, and a heavy undertow is felt when in the vicinity of the rocks. The northwestern shore of the cove is bluff, rocky, and bare of trees for over 0.5 mile. The entrance is marked by a bell buoy, but the channel narrows to 60 yards by covered rocks north of the inner visible rock. The beach area at Little River is a State Park.

The two-mile coast between Little River and Mendocino Bay is a broad tableland with a seaward face of cliffs, 40 to 60 feet high, bordered by numerous low rocks. The tree line is over 0.5 mile from the cliffs.

Mendocino Bay, 21 miles northward of Point Arena, affords fair shelter in northwesterly weather, but vessels are obliged to leave in southerly or westerly weather. In heavy southwesterly gales the sea breaks clear across the entrance. The southern point at the entrance is a rocky, irregular cliff 100 feet high, bordered by numerous rocks extending 150 yards offshore. A knoll 156 feet high is 300 yards inshore from the point. A reef covered 3¼ fathoms extends 500 yards northwestward of the outermost visible rock. This area should be avoided when there is any swell running. The northern point is a broken cliff 60 feet high, bordered by numerous rocks close inshore. A whistle buoy marks the entrance to the bay.

Big River enters in the northeastern part of Mendocino Bay. The town of **Mendocino** is on the northern shore of the bay. Groceries and water may be obtained.

Russian Gulch, 2 miles northward of Mendocino, is a small cove occasionally used as an anchorage by small craft with local knowledge as it affords excellent protection. A State Park is at the head of the cove. The concrete arch highway bridge across Russian Gulch should show well from southward to westward. An important danger is a rock awash 400 yards northwestward of the southern entrance point. A reef covered 1¼ fathoms extends 200 yards southeastward of the rock.

Point Cabrillo, 3 miles northward of the town of Mendocino and 24 miles northward of Point Arena, is a flat-topped point 50 to 60 feet high, terminating seaward in nearly vertical cliffs; numerous low rocks extend offshore over 200 yards, and the 30-fathom curve is barely 0.2 mile outside of them. The point is bare except for a few trees at the houses near the light.

Point Cabrillo Light (39°20.9′ N., 123°49.5′ W.), 84 feet above the water, is shown from a 47-foot white octagonal frame tower on a dwelling on the point; a fog signal is at the station.

From Point Cabrillo the coast trends northward for 9 miles to Laguna Point as a nearly straight line of bluffs, with numerous rocks close under the cliffs. It is moderately high, partly wooded to the face of the cliffs, and is broken by several indentations and small streams. The 30-fathom curve is an average distance of 1 mile from shore.

Caspar Anchorage, a mile northward of Point Cabrillo, is a small cove at the mouth of **Caspar Creek.** Fair shelter, except from westward, is afforded, but the anchorage is contracted and seldom used. The village of **Caspar** is on the northern bank of the creek near its mouth. Groceries may be obtained in limited quantities.

Chart 5703.—From Caspar Creek for 4 miles to Noyo Anchorage the coast consists of broken irregular cliffs, 40 to 60 feet high, with numerous rocks extending 400 yards offshore. These are fairly well fringed by kelp, especially in summer.

Noyo Anchorage, 5 miles northward of Point Cabrillo, affords fair shelter from northward or southward. The anchorage is liimted to an area about 400 yards long and less than 200 yards wide, with depths of 3½ to 6½ fathoms. Buoys mark the entrance to the anchorage.

Noyo River enters at the head of the cove. A jetty with a light on its outer end and a fog signal 80 yards inshore is on the north side of the entrance, and a small jetty with a daybeacon on the outer end is on the south side of the entrance. A fixed highway bridge across the river, 300 yards east of the mouth, has a clearance of 80 feet. Depths are about 9 feet through the entrance and thence 4 feet for 0.4 mile above the bridge. The channel is marked by buoys and a light.

Caution is necessary in entering to avoid the reefs on the southern side of the entrance. With a heavy westerly or southwesterly swell there are breakers at the entrance to the river; once inside there is good shelter.

The village of **Noyo** is on the banks of the river 0.4 mile above the mouth. It is the principal commercial and sport fishing center of this section of the coast and many fishing boats are based here. There are several fishhouses with wharves having depths from 4 to 8 feet alongside where water can be obtained. Fuel is available at two

oil wharves; general and marine supplies are available in the village and at Fort Bragg. There are machine shops and machine railways where boats up to 60 feet in length with a draft of 6½ feet can be hauled out.

From Noyo River for 0.7 mile to Fort Bragg, the coast consists of rocky cliffs, 40 to 60 feet high, bordered by rocks and sunken ledges extending 100 to 400 yards offshore.

Fort Bragg, 30 miles northward of Point Arena, is the largest coast town between San Francisco and Eureka. It is located near the head of a cove formerly known as **Soldiers Harbor.** The former loading wharf has been removed; lumber is now shipped out by rail and truck. Groceries can be obtained and minor repairs made.

The cove is contracted by the rocks and ledges extending from both the north and south, leaving only a limited area for small boats to anchor. A rocky reef, partly bare at high water, extends southwestward from the northern head and breaks the force of the swell from northwestward. In westerly weather the cove is wide open. Since Noyo River gives better protection, the cove is seldom used.

From Fort Bragg for 3 miles to Laguna Point, the coast is moderately low and rocky and cut by two small streams; the tree line is within 0.2 mile of the beach.

Laguna Point, 8.5 miles northward of Point Cabrillo, is near the southern end of Ten Mile Beach. It is a small, projecting cliff, 30 feet high, flat-topped, and bare of trees for 600 yards. It is noticeable only when close inshore. A bare reef extends 300 yards northwestward from the point. The cove immediately northward of Laguna Point is exposed and only available for small boats. It affords fair protection in southerly weather and is occasionally used in winter.

Bald Hill, 2.5 miles southeasterly of Laguna Point, is a prominent landmark; its summit and southwestern slope are bare of timber.

Chart 5602.—For 0.5 mile northward of Laguna Point the bluffs are low, thence a straight sand beach extends for 3 miles to the mouth of **Ten Mile River.** The beach is backed by sand dunes for 0.5 mile inland, with the tree line about 1.5 miles from the beach. The concrete highway bridge over Ten Mile River is conspicuous from the westward.

From Ten Mile River the coast extends in a general northwesterly direction for 52 miles to Punta Gorda. This stretch of the coast is particularly bold and rugged, bordered by numerous rocks, and as far as Point Delgada, is heavily timbered. Northward of Point Delgada the tops of the ridges are generally bare or only partly covered with trees and brush. The cliffs along the shore range from 40 to 100 feet in height. The high, rugged mountains in the vicinity of the coast, which reach elevations of 3,000 to 4,000 feet, are prominent.

Kibesillah Rock, 1.2 miles northward of Ten Mile River and 0.4 mile off the line of the cliffs, is the outermost danger for many miles north and south. It is small and washed over almost continuously even in ordinary weather. Other rocks and rocky islets up to 80 feet high are inside of Kibesillah Rock.

Bells Mountain, 4.5 miles northward of Ten Mile River and 0.5 mile inland, is bare on top with a few trees on the oceanside.

Switzer Rock, 5.5 miles northward of Ten Mile River and 600 yards offshore, is small with deep water close around it; every large swell washes over the rock. A covered rock marked by a breaker is 170 yards southeast of Switzer Rock.

Gordon Hill, 6.5 miles northward of Ten Mile River, is bare to the summit and terminates seaward in 60-foot high **Abalone Point** which is bordered by low outlying rocks.

Hardy Rock, 9.5 miles northward of Ten Mile River and 0.4 mile offshore, is a small 47-foot high islet.

From Abalone Point the coast trends northwestward for 4 miles to **Cape Vizcaino,** which is a broad, irregular line of precipitous cliffs, 100 feet high, very broken, and bordered by low rocks, 200 to 300 yards offshore.

Island Knob, a rocky lime-covered islet, lies close-to and almost connected with Cape Vizcaino. A covered rock marked by a breaker is 275 yards westward of the islet. **Cottaneva Rock,** 20 feet high, is 500 yards southeastward of Island Knob and 275 yards offshore. Several smaller rocks lie inside of it and two others about 160 yards northwestward.

Cahto Peak, 11.5 miles eastward of Cape Viscaino, is prominent in clear weather.

Between Cape Vizcaino and Point Delgada are several small exposed landings available for use only in the summer and in smooth weather. The landings formerly were used to ship ties, tanbark, and shingles which were loaded on vessels by means of wire cables.

Sea Lion Rock, a mile northward of Cape Vizcaino and 500 yards offshore, is 5 feet high and inhabited by sea lions. **Cottaneva Needle,** 0.5 mile north of Sea Lion Rock, is a prominent black pinnacle rock 55 feet high.

Double Cone Rock is 3.5 miles northward of Cape Vizcaino and 300 yards offshore.

Usal Rock, 5 miles northward of Cape Vizcaino, is 45 feet high and black in color. It lies 200 yards off a small point of rocks.

The mouth of **Usal Valley** is about a mile northward of Usal Rock, and is a narrow, steep gulch, in front of which is a small area of flat land with a low beach. A small grassy hillock is just inside the gulch. The view up the valley is open for a very short time while passing.

Big White Rock, 95 feet high, lies 7.7 miles northward of Cape Vizcaino, and 125 yards offshore from the steep cliffs, which are bordered by numerous rocks. The rock is a prominent feature when the higher points of the land are in fog. A whistle buoy is about 0.8 mile westerly of the rock.

Anderson Cliff, 10 miles northward of Cape Vizcaino, is a projecting rocky spur 715 feet high, with one large rock and numerous smaller ones close inshore. **Jackson Pinnacle,** 1.1 miles northward of Anderson Cliff, is a black rock 45 feet high so close to the rocky beach that

from seaward it is hard to distinguish from the bluff behind it. When seen from along shore it is prominent.

Cluster Cone Rock, a prominent 68-foot pinnacle, is the largest and whitest of a small cluster of 6 rocks, 200 yards offshore, lying 12.5 miles northward of Cape Vizcaino.

Morgan Rock, a large white-topped block-shaped rock 57 feet high and 0.5 mile northwestward of Cluster Cone Rock, shows prominently. It is the largest of a group of rocks extending some 200 yards from a high rocky cliff and is particularly valuable as a landmark when higher land is covered by fog.

Bear Harbor Ridge, a detached coastal ridge about a mile northwestward of Cluster Cone Rock, has two peaks, the southern one, 375 feet high, being the higher. It is the most prominent feature in this vicinity when viewed from the northwestward. The seaward face of the ridge is marked by steep, loose slides.

Needle Rock, 46 feet high, is 14.5 miles northward of Cape Vizcaino; the rock blends into the bluff from offshore. A group of old mill buildings, a few houses, and an old landing platform about midway up the flat, mark the abandoned landing.

Small White Rock, 37 feet high, lies 5 miles northward of Cluster Cone Rock and 4 miles southward of Point Delgada. It is close inshore and just outside the low-water beach; once identified, this rock makes a valuable landmark.

From just below Small White Rock to Point Delgada, the country is not timbered but is covered with dense, low brush, which presents a uniform dark green appearance.

A submarine ridge known as **Tolo Bank** extends southward from Point Delgada for about 7 miles. The depths are quite irregular, the least found being 9 fathoms.

Caution.—The area just south of Shelter Cove is subject to slides which might deposit rocks along the shore.

Chart 5773.—Point Delgada, 66 miles northward of Point Arena, and nearly 20 miles southward of Punta Gorda, is a cliff-faced plateau making out about a mile from the general trend of the coast. The seaward face of the plateau is a mile long and bordered by numerous rocks. A lighted whistle buoy is 1.1 miles southwestward from the point and a bell buoy 0.8 mile southeastward from the point. The small white bell tower on the east end of the point is prominent from the anchorage.

On the point is an airplane landing strip. The words SHELTER COVE in large white letters are painted on the slanting roof of a building 100 yards northward of the bell tower. The sign shows well from seaward.

Shelter Cove lies under the southern face of Point Delgada and affords fair shelter in northwesterly weather, but is exposed and dangerous with southerly or westerly winds. There is nearly always a swell running. There are no wharves in the cove. Gasoline and water can be obtained ashore but must be carried down from the plateau.

Shelter Cove is used extensively as an anchorage by a large fishing fleet. A good dirt and gravel road is kept open in all but the worst weather, there are telephone facilities.

The rocks covered 1 to 5 fathoms southward of Point Delgada can be avoided in approaching Shelter Cove by staying over 200 yards southward of the lighted whistle buoy and eastward of the bell buoy.

Chart 5602.—From Point Delgada the coast extends northwestward for 19 miles to Punta Gorda, and is backed by steep mountains covered with chaparral and trees. A sand beach, 0.8 mile northward of Point Delgada, extends northward for 4 miles. **Kaluna Cliff** overlooks the southern end of the sand beach and its steep face, scarred by frequent slides, is a noticeable landmark.

King Peak, 4,090 feet high, the highest of three, is the well-known landfall generally called Three Peaks. It lies 8.5 miles northward of Point Delgada, 2.5 miles from the coast, and in clear weather is visible seaward for about 75 miles.

About 6 miles northward from Point Delgada is the head of **Delgada Canyon,** a submarine valley, the 100-fathom curve lying within 0.5 miles of the beach. This valley extends in a northerly direction with an average width of 1 mile between the 100-fathom curves for 3.5 miles, and then expands, funnel-shaped, for 3 miles more. Over 400 fathoms are found at its mouth and 300 fathoms within 4 miles of the beach. The side slopes are steep.

Big Flat is a narrow strip of low, flat land 7 miles northwestward of Point Delgada. It is 2 miles long and is bordered by sand beaches. A few abandoned ranch houses and barns are at the southern end of the flat. **Shubrick Rock,** low and small, lies 300 yards off the southern end.

About 11.5 miles northwestward of Point Delgada is the head of **Spanish Canyon,** a submarine valley. The 100-fathom curve lies within 2 miles of the shore.

Reynolds Rock, 10 feet high, is 14.5 miles northwestward of Point Delgada. It is 550 yards offshore and when seen from close inshore appears as a double-headed rock over which the swell breaks in nearly all weather.

Rodgers Break, 0.5 mile westward of Reynolds Rock, is covered ½ fathom. This pinnacle rock lies 4 miles southeastward of Gorda Rock and 6.8 miles west-northwestward of Big Flat; it seldom breaks and the top is occasionally seen in a heavy swell. The rock is marked by a lighted whistle buoy. A pinnacle rock covered 3 fathoms lies about 0.5 mile northwestward of Rodgers Break and about the same distance offshore. It probably breaks in very heavy weather. This pinnacle and Rodgers Break are the outermost known dangers in this stretch of the coast.

From Reynolds Rock northwestward to Punta Gorda the shore is bordered by numerous rocks extending about 0.3 mile offshore. The sharp depression in the hills near the coast, caused by the gulch of **Cooskie Creek,** 3.5 miles southward of Punta Gorda, is sometimes useful on dark nights to vessels close inshore in making the point from southward.

Chart 5795.—Punta Gorda is a high, bold, rounding cape, 83 miles northwestward of Point Arena and 11 miles southward of Cape Mendocino. The seaward face rises to about 900 feet, 400 yards back from the beach, and terminates in a spur, 140 feet high, almost overhanging the sea. It is bare of trees except in the gulches. The gray rectangular structure of an abandoned lighthouse, 25 feet high, is southerly of the point. For over 1.5 miles northward and about 2 miles southward of the point, the beach is bordered by numerous rocks and shoals extending in some cases 0.6 mile offshore.

The wind, sea, and currents off Punta Gorda are probably as strong as off any point on the coast; frequent and strong tide rips have been noted. Many times when the weather at Shelter Cove and even at Big Flat is clear and calm and the sea smooth, both the wind and the sea will pick up as Punta Gorda is approached, until just northward of this point where strong breezes to moderate gales will be experienced. At other times clear weather southward of this point will lead to fog northward, or vice versa.

Gorda Rock, 10 feet high and conical in shape, is 0.7 mile southward of Punta Gorda and 0.6 mile offshore. A lighted whistle buoy is 300 yards southwest from the rock.

Conical Rock, 20 feet high, lies 200 yards off the point, and a small, low rock lies 350 yards westward from it; foul ground is between these rocks.

From Punta Gorda to Cape Mendocino the hills back of the coast are lower than those southward; they are bare of trees and bordered by stretches of low, narrow, sandy flats with a narrow, low-water beach. The outlying rocks are not more than 0.7 mile offshore until about 2.5 miles south of Cape Mendocino, where they extend offshore to Blunts Reef, 2.5 miles west of the cape. **Mattole Canyon,** a narrow submarine valley, is 3 miles northward of Punta Gorda where the 100-fathom curve is about a mile from the beach. **Mendocino Canyon** is 4.5 miles southward of Cape Mendocino where the 100-foot curve is about 2 miles from the beach.

Christmas Rock, covered 1¼ fathoms, is 0.9 mile northwesterly of Punta Gorda.

Mattole River, 2 miles northward of Punta Gorda, is not navigable. The northern 360-foot high head is bare and the southern head, about the same height, is partly covered with oak trees. A prominent sand dune is on the southern side at the entrance to the valley. Another large sand dune, 3.5 miles to the northward, marks the northern side of **McNutt Gulch** and should not be confused with the one at Mattole River.

Mattole Point is 0.3 mile northward of the river at the base of **Moore Hill.** A rock, 8 feet high, is 0.3 mile northward of Mattole Point and 250 yards off the beach at the head of Mattole Canyon. A rock covered ½ fathom lies 0.4 mile northwest by north of Mattole Point.

Sea Lion Rock, 16 feet high, is the largest of a cluster of small rocks 0.5 mile offshore and nearly 4 miles northwards of Punta Gorda. **The Brothers,** 8 feet high, consist of two small rocks, close together, 800 yards offshore and 0.5 mile northward of Sea Lion Rock. **Mussel Rocks,** 0.9 mile north of The Brothers, form a ledge that projects 400 yards from the shore.

Devils Gate Rock, 20 feet high, lies nearly 2.8 miles southward of Cape Mendocino and 0.5 mile offshore. It is low and pyramidal, with a smaller rock close under the northwestern face. A reef extends 200 yards westward from the rock; numerous rocks lie inshore. A rocky shoal covered 3¾ fathoms lies 1.4 miles westward of Devils Gate Rock.

Steamboat Rock, 30 feet high, lies 1.5 miles southward of Cape Mendocino and 600 yards offshore. The upper part of the rock is white and the lower black, somewhat resembling a steamer with a low black hull and white upper works.

Cape Mendocino, 185 miles north of San Francisco Bay entrance and 367 miles south of Columbia River entrance, is a mountainous headland, the famous landmark of the old Spanish navigators and the galleons from the Indies. The cape is the turning point for nearly all vessels bound northward or southward. In view of the dangers in the vicinity, it should be approached with considerable caution in thick weather; the bottom and the currents are very irregular. It is in the latitude of great climatic change; the winds do not blow home so violently in the bight southward of it, and the amount of rainfall increases rapidly to the northward. Fog is more prevalent southward. The strong northwesterly winds of summer are less violent southward of the cape which forms a parallel lee for vessels working their way northward.

The seaward face of Cape Mendocino is steep, rocky, and water worn toward the shoreline. Northeastward of the light the general appearance is rolling and grass-covered, except in the deep ravines and upon some of the steep hillsides where the northern exposure is covered with forest or brush. For about 3 miles southward of the cape the beach is bordered by numerous rocks and sunken ledges extending in some cases to over 0.5 mile offshore. **Cape Mendocino Light (40°26.4′ N., 124°24.4′ W.),** 422 feet above the water, is shown from a 43-foot white pyramidal tower on one of the western spurs.

Sugar Loaf, 326 feet high, is 250 yards westward of Cape Mendocino and is connected with it at low water by a narrow neck of rocks and shingle beach. This rock is a prominent feature in making the cape from either northward or southward, but in thick or hazy weather care should be taken to avoid mistaking it for False Cape Rock, which it somewhat resembles, that is in a similar position off False Cape, 4.5 miles northward of Cape Mendocino. False Cape Rock is about 216 feet high and is not so regular in outline as the Sugar Loaf, and from the westward or northwestward, shows two large rocks, 95 and 54 feet high, immediately inside of it, whereas the Sugar Loaf stands solitary and compact. As seen from the southwestward, Sugar Loaf shows a cave on its southwestern face, extending about one-third the height of the rock.

Blunts Reef, 2.9 miles west by north of Cape Mendocino Light, is one of the outermost visible dangers off Cape Mendocino. The reef consists of two small black rocks awash about 230 yards apart. **Blunts Reef Lightship**

(40°26.4′ N., 124°30.3′ W.), with red hull and the name BLUNTS in large white letters on the sides, is 1.7 miles west-southwestward of the outer rock; the light is 65 feet above the water. The lightship has a fog signal and a radiobeacon. The code flag and radio call is NNCB. **Storm warning displays** are made during the daytime. The currents at the lightship are described in the Tidal Current Tables.

The area as far west as the lightship and for about 4 miles north and south of Cape Mendocino includes dangerous rocks and covered ledges. Vessels should not attempt the passage between Blunts Reef Lightship and the cape under any circumstances. A heavy westerly swell breaks even in 9 to 10 fathoms in this locality.

From Cape Mendocino for 4.5 miles to False Cape, the coast is straight, bold and bordered by a broad low-water beach.

False Cape is a steep, bold headland, rising to a height of over 600 feet in less than 0.2 mile from the beach; it projects slightly from the general trend of the coast. It is covered with grass, but the gulches on its sides are wooded. The base of the cape is bordered by a narrow, low-water beach of shingle and sand. For about a mile on each side of the cape are numerous rocks and ledges, the outermost of which are about a mile from the beach.

False Cape Rock, 216 feet high, lies 0.4 mile westward of the cape; other rocky islets are between it and the shore. It is not as regularly shaped nor as high as the Sugar Loaf off Cape Mendocino, and the top is much flatter. A rock covered 1¾ fathoms lies 0.6 mile westward of False Cape Rock. **Mussel Rock,** 7 feet high, is 0.8 mile northward of False Cape Rock.

Chart 5602.—Northward of False Cape the hills decrease in height; 4 miles beyond the cape is the beginning of a stretch of sand beach and dunes, broken only by Table Bluff and Buhne Point, that extend to Trinidad Head.

Centerville Beach, 4 miles northward of False Cape, is not prominent from seaward. A white cross is on the 120-foot bluff just southward of Centerville Beach. A number of buildings, comprising the U.S. Naval Facility for oceanographic research, are on the bluffs 0.8 mile southward of the village.

Eel River empties 8 miles northward of False Cape. This is a stream of considerable size and is occasionally entered by light-draft vessels, but the channel over the bar is continually shifting. The depth on the bar varies largely with the amount of water in the river, depending upon the character of the winter, and has been at times as much as 14 feet, but generally the depth is about 8 or 9 feet. The river is seldom entered except by fishing boats and other very small craft, and then only by those with local knowledge of the bar.

Eel Canyon is a submarine valley extending in a northwesterly direction. It comes to a head 10 miles northwestward of Cape Mendocino. Vessels are cautioned against mistaking this valley for one of those southward of the cape.

Chart 5832.—Table Bluff, 12 miles northward of False Cape and 4.5 miles southward of Humboldt Bay entrance, is a prominent feature from seaward. The western face is 0.5 mile long, 165 feet high, very steep, and has a narrow sand beach under it. **Table Bluff Light (40°41.7′ N., 124°16.4′ W.),** 176 feet above the water, is shown from a 35-foot white square tower near the extreme western edge of the bluff.

From Table Bluff for 4 miles to Humboldt Bay entrance the coast consists of a narrow sand spit.

Humboldt Bay, 21 miles northward of Cape Mendocino Light, is the first important harbor northward of San Francisco, and is used by vessels drawing up to 30 feet. It can be used as a harbor of refuge in impending bad weather, providing a vessel can get inside before the bar becomes impassable. The bay consists of two shallow basins, South Bay in the southern part and Arcata Bay in the northern part, connected by a narrow channel about 5 miles long.

A large quantity of lumber is shipped to both foreign and domestic ports; some farm and dairy products, livestock, leather, and fish are also shipped, mostly to San Francisco. General merchandise, gasoline, and fuel oil are received.

Prominent features.—Table Bluff Light, 4 miles southward of the entrance, is the best landmark by night. By day the tall stacks and the smoke from the sawmills in the bay can usually be seen. North Spit has clumps of trees along the bay shore near the channel while South Spit is barren. The red bluff at **Buhne Point** on the eastern shore of the bay, a power plant about 0.5 mile eastward, with a stack and large storage tanks nearby, and a lighted radio tower about 0.5 mile farther eastward, are conspicuous in entering the bay. A Coast Guard station is inside the North Spit, 0.5 mile from the southerly end.

The approach to the bay is marked by a lighted whistle buoy and a bell buoy off the entrance, and a radiobeacon, fog signal and approach range lights on the outer end of the North Spit. A light is on the south jetty, 165 yards from the outer end. The entrance channel inside the bar is marked by range lights and lighted buoys.

Note.—The outer range should not normally be used beyond its intersection with the inner range. The inner range should not normally be used seaward of the outer end of the jetties.

Two jetties are at the entrance to the bay, 750 yards apart. The bar northwestward of the south jetty is subject to considerable shifting and shoaling at times, especially during the winter.

In the past **Humboldt Bar** was considered treacherous and dangerous, and many disasters have occurred here. With the present improvements, however, and by employing local pilots, vessels may enter or leave with comparative safety. The strong currents that may be encountered, and the abrupt turn at the outer end of the south jetty are apt to be dangerous for strangers. The bar is the smoothest during the last of the flood current and it is often passable at this time and impassable two

hours later, when the ebb current has set in. Caution should also be exercised inside the jetties due to the rapid change in the channel conditions. Deep-draft vessels are usually taken in and out of the bay at high tide if there is any swell on the bar because of the shoaling in the entrance channel.

Boundary lines of inland waters.—The line established for Humboldt Bay is described in **82.129,** Chapter 2.

Channels.—Federal project depths for Humboldt Bay are 40 feet over the bar, thence 40 feet through the entrance, thence 30 feet in Eureka Channel outer reach, and thence 26 feet through the inner reach. Project depths in Samoa Channel are 30 feet, and in Fields Landing Channel, 26 feet. Maintenance dredging is performed regularly.

Arcata Bay is about 3 miles in diameter, with low, marshy shores, cut by many sloughs.

Along the eastern shore of Humboldt Bay, northward to Eureka, are several sawmills, with docks built out to the channel, from which lumber is shipped.

Fairhaven is a small town on the western shore, 2 miles above the entrance. A small boatyard has a marine railway capable of hauling out craft up to 50-ton weight, 65-foot length, and 6-foot draft. A plywood plant, with a concrete stack and tall silver elevated tank, is here.

Eureka, the principal town on the bay, is on the eastern shore, 4 miles northward of the entrance. It handles most of the waterborne traffic of the bay and is the terminus of a railroad from San Francisco, although a branch of the railroad continues to Arcata and Samoa.

Drawbridge regulations for **Eureka Slough,** eastward of Eureka, are given in **203.718,** Chapter 2.

Samoa, on the western shore opposite Eureka, is the terminus of a railroad from Arcata. There are large sawmills, and a considerable amount of lumber is shipped. There is a depth of 23 feet alongside the docks. The high concrete stack is very prominent from offshore. There are three black tanks westward of the stack and two similar tanks to the southward. A privately owned passenger ferry operates between Samoa and Eureka.

Arcata is on the northern shore of the bay. There are no serviceable wharves in the town. The ruins of several old wharves are near the head of Arcata Channel.

South Bay, in the southern part of Humboldt Bay, is about 3 miles long and 2 miles wide. The marked channel on the east side of the bay leads to the lumber terminals at **Fields Landing.** There are depths of 18 to 20 feet alongside the loading wharves. A small boatyard has a marine railway capable of hauling out boats up to 80 feet in length and 100 tons in weight.

Anchorage.—The best anchorage is between **Bucksport** and the light at the southern end of **Gunther Island,** according to draft. Vessels in anchoring must keep clear of the cable crossing the channel just above Fairhaven. It is forbidden to anchor in Eureka Channel longer than 24 hours at a time. If obliged to anchor outside the bar, the best anchorage will be found southward and westward of the lighted whistle buoy in about 90 feet, sand and clay bottom.

Routes.—A pilot should be engaged by strangers if there is any sea on the bar, and by deep-draft vessels. Because the bar is subject to change, the entrance ranges may not always mark the deepest channel.

From southward.—From a position 1.5 miles 260° from Blunts Reef Lightship, steer **356½°** for 5 miles, when Table Bluff Light should bear 048°; thence a **038½°** course made good for 20 miles leads to Humboldt Bay Entrance lighted whistle buoy HB. In thick weather, after passing False Cape Rock, all dangers will be cleared by keeping in a depth of over 15 fathoms until up with the lighted whistle buoy, where anchorage should be made until a pilot is obtained.

From northward.—From a position 3 miles westward of Trinidad Head Light, a **187°** course, made good for 17 miles, leads to Humboldt Bay Entrance lighted whistle buoy HB. On this course Table Bluff Light, 5 miles southward of Humboldt Bay Entrance lighted whistle buoy HB, should be made ahead. In thick weather the depths should not be shoaled to less than 20 fathoms between Turtle Rocks and Trinidad Head and, when southward of the head, the depths should not be shoaled to less than 15 fathoms until up with the lighted whistle buoy, where a vessel should anchor until a pilot is obtained.

From seaward.—In clear weather the high land of Cape Mendocino and Punta Gorda southward, and Trinidad Head northward of the entrance, are good landmarks. At night, the lights are a good guide. In thick weather soundings should be taken frequently, and upon getting depths of 30 fathoms or less great caution must be exercised until sure of the vessel's position, when the course should be shaped for the lighted whistle buoy.

Sailing craft during the prevailing northwesterly winds of summer should try to make the land in the vicinity of Trinidad Head; this gives a fair slant for the entrance and is an additional precaution against the irregular southerly set of the current. In thick weather soundings should be taken constantly when inside of 50 fathoms. Making the land northward of the entrance avoids the irregular bottom and dangerous currents in the vicinity of Cape Mendocino.

From the Humboldt Bay Entrance lighted whistle buoy HB, Humboldt Bay Approach Range, course **105°,** and Humboldt Bay Entrance Range, course **140°,** leads into the bay. The entrance range parallels the south jetty and is only about 150 yards from it. The turn from the approach to the entrance range, 200 yards off the outer end of the south jetty, is rather abrupt and is difficult under certain conditions of wind, sea, and current. Inside the bay the channels are well marked by navigational aids.

Tides.—The mean range of tide at Eureka is 4.8 feet. The range between mean lower low water and mean higher high water is 6.7 feet. A range of about 11 feet may occur at the time of maximum tides. Daily predictions for Humboldt Bay (South Jetty) are given in the Tide Tables.

Currents.—The tidal currents follow the general direction of the channels. In the main channel, the velocity

is less than 2 knots, and does not exceed 3 knots. Between the jetties, the velocity is about 2 knots, with a maximum of about 4 knots. Current predictions are given in the Tidal Current Tables.

See Appendix for **storm warning displays.**

Pilotage.—Vessels requiring a pilot should wire 24 hours in advance, cable address "Humbar." Ladder should be rigged 6 feet from the water as pilots board from a tug or launch.

Tugboats are available.

Quarantine.—Regulations of the U.S. Public Health Service are enforced. An outpatient office of the Public Health Service is in the city.

Customs.—Eureka is a port of entry; marine documents are issued.

Harbor regulations are prescribed by the State and city Board of Harbor Commissioners. A wharfinger, located at the Eureka Boat Basin, foot of Commercial Street, has jurisdiction over fishing and pleasure craft using the facilities at the city-owned boat basin.

Supplies.—Fuel oils, groceries, water, and marine hardware can be obtained at Eureka.

Repairs.—Minor repairs to machinery and to woodwork above water can be made. The largest of two marine railways in the bay can haul out boats up to 100 tons.

Chart 5602.—Northward of the entrance to Humboldt Bay, the coast consists of sand dunes partly covered with timber for 11 miles to the mouth of **Mad River.** The first 7 miles forms the western shore of Humboldt Bay and then the land behind the dunes is low and marshy as far as the river.

From the mouth of Mad River, the sand dunes varying in height from 20 to 60 feet, continue for 5.5 miles to **Little River,** a small shallow stream. The northern point at the mouth of the stream is rocky, and from this point the coast consists of rocky cliffs extending beyond Trinidad Head.

Chart 5846.—Little River Rock, 126 feet high, is 0.8 mile northwestward of the mouth of Little River, and 0.3 mile offshore. Several rocks and foul ground are between it and the beach, and a rock 4 feet high is about 100 yards northwestward.

From Little River Rock to Trinidad Head the shore is bordered by numerous rocks and ledges extending 0.3 mile offshore.

Pilot Rock, 93 feet high, is 0.5 mile southward of Trinidad Head. It is of small extent, conical, and whitish in color, rising abruptly from depths of 48 to 50 feet on all sides. Pilot Rock is marked on its western side by a gong buoy.

Trinidad Head is nearly 39 miles north-northeast of Cape Mendocino and 17.5 miles northward of the entrance to Humboldt Bay. It rises to a height of 380 feet. The sides are steep and covered with chaparral. From northward or southward the head is generally raised as a dark, round-topped island. Near the northern end it is joined to the mainland by a narrow neck, from the southern side of which **Little Head,** a rocky knoll 125 feet high, projects into Trinidad Harbor. The white cross 200 yards northward of the southern point of Trinidad Head is fairly prominent.

Trinidad Head Light (41°03.1′ N., 124°09.0′ W.), 196 feet above the water, is shown from a 25-foot white pyramidal tower near the southwest side of the head; a fog signal is near the light. A lighted whistle buoy is 1 mile west of the head.

Trinidad Harbor, a small cove eastward of Trinidad Head, affords shelter in northwesterly weather but is dangerous in westerly or southerly weather. The cove is small and is further contracted by several rocks, and as a rule, there is always a swell even in northerly weather. It is used by fishing boats to a considerable extent during the summer even though the holding ground is only fair. A wharf with a fishhouse is in the bight west of Little Head. Fish are unloaded at the wharf and are trucked to Eureka and San Francisco. Some groceries may be obtained at **Trinidad,** a village on the north shore of the cove.

Prisoner Rock, 220 yards east of Trinidad Head, is 42 feet high and the most prominent of the rocks in the cove. It consists of two rocks so close together that they are usually taken for one. From southward they resemble an animal lying down with its head toward the west. A rock covered 7 feet is 150 yards north-northwestward from them.

Flat Rock, low and small, lies 350 yards northeastward from Prisoner Rock; a rock covered 5 feet lies 150 yards southeastward from it. A bell buoy is 175 yards west of a rock covered 9 feet which lies 400 yards southeastward of Prisoner Rock.

The best anchorage is in 42 feet, muddy bottom, about halfway between Prisoner Rock and Trinidad Head, with Flat Rock, bearing 073°, just open southward of Prisoner Rock.

Blank Rock, 111 feet high, lies 0.3 mile westward of Trinidad Head. Foul ground is between it and the head. A smaller rock is 150 yards northward of Blank Rock. A rock awash and a ledge covered 15 feet are 275 yards southeastward of Blank Rock.

Off-Trinidad Rock, 72 feet high, lies 0.3 mile northwestward of Blank Rock. It is considerably larger than Blank Rock, with two rocky heads of about the same height. A covered rock lies 300 yards off its southwestern face, and numerous ledges extend southeastward toward the head.

Chart 5702.—From Trinidad Head for 5.5 miles to Rocky Point, the coast is rocky, with numerous outlying islets and ledges extending as much as 1.2 miles offshore and cliffs reaching elevations of over 100 feet. The mountains back of Trinidad Head are good landmarks for vessels approaching from seaward. Northward of Rocky Point, the beach is low and sandy, with several lagoons behind it, for nearly 11 miles to the southern end of the Gold Bluffs. From this point to Point St. George, the coast is rocky, the cliffs being from 100 to 500 feet in height and bordered by numerous rocks. The Klamath River breaks through the cliffs 16 miles southward of

Point St. George. From Point St. George for 65 miles to Cape Blanco, the coast trends in a general northwesterly direction with a shallow bight known as Pelican Bay immediately northward of Point St. George. The beach is fringed by numerous rocks and ledges, but, with the exception of Rogue River and Orford Reefs, these in general do not extend over a mile from shore. The 30-fathom curve follows the general trend of the coast, and in thick weather may be considered as the limit inside of which it is unsafe to approach, but in the vicinity of Rogue River and Orford Reefs, the depths should not be shoaled to less than 50 fathoms.

Green Rock, 108 feet high and of small extent, lies 1.5 miles northward of Trinidad Head and nearly 600 yards offshore. The top is covered with grass. Numerous rocks lie inshore, and a rock awash lies 700 yards westward of it. A rock covered 3 fathoms lies 0.5 mile westward of Green Rock. It seldom breaks and rises abruptly from 15 fathoms. Two covered rocks lie 0.5 and 0.8 mile northeast by north of Green Rock.

White Rock, 118 feet high, lies 1.9 miles northward of Trinidad Head. It is of small extent and is 250 yards off a wooded projecting head about the same height. Another rocky islet 129 feet high is 1 mile northward of White Rock.

Cone Rock, 17 feet high, is 3.8 miles northward of Trinidad Head and over a mile offshore. It is conical in shape and of small extent. A smaller rock, 15 feet high, lies 0.5 mile eastward.

Turtle Rocks, two rocks of small extent 20 and 29 feet high, are 1.5 miles northward of Cone Rock and abreast of Rocky Point. Eastward of Turtle Rocks the ground is foul, with two breakers 600 and 800 yards from the outer rock and numerous visible rocks extending to the beach. A bell buoy is 0.5 mile westward of Turtle Rocks.

Rocky Point, 5.5 miles northward of Trinidad Head, is a bold feature with cliffs about 200 feet high, bordered by numerous rocks and ledges extending 200 to 300 yards offshore. The point is covered with oak and scrub pine for 0.5 mile back to the redwood forest; through this oak growth two rocky pinnacles about 250 feet high are visible.

Rodgers Peak, 6.3 miles northeastward of Rocky Point, is heavily wooded and easily identified.

Northward of Rocky Point the cliffs are succeeded by a low sandy beach for 4.5 miles to the north end of **Big Lagoon,** which is immediately behind the sand beach. Above Big Lagoon the cliff formation is resumed and extends 2 miles to **Stone Lagoon.**

Sharp Point, 6.2 miles northward of Rocky Point, is a sharp-pointed conical rock cliff about 400 feet high. Its light-gray color makes it readily distinguishable for a distance of 15 miles in clear weather from any direction. The beach in this area is bordered by numerous rocks extending about 0.8 mile offshore.

Gold Bluffs, a 9-mile stretch of gravel and sand 100 to 500 feet high, begin about 9 miles northward of Rocky Point. The southern part is comparatively low and bordered by several outlying rocks; in about the middle the bluffs are broken by two valleys.

Mussel Point, 11.2 miles northward of Rocky Point, is a light gray cliff about 300 feet high, with a small, flat top distinguishable at 10 to 12 miles in clear weather.

Redding Rock, 94 feet high and of small extent, is 4.5 miles offshore west of Mussel Point. It is dark for about one-third the height and white above with a cleft on the southern face. It rises abruptly from depths of 20 fathoms and can be approached close-to with safety. It is marked by a white 18-foot square pyramidal skeleton tower on a house. A lighted whistle buoy is 400 yards southwestward of the tower.

Northward of Gold Bluffs the coast becomes rocky, irregular, and broken, the bold cliffs being bordered by many rocks.

A yellow clay slide extending from the top of a 900-foot slope to the beach is 9 miles northward of Mussel Point. It is sharp at the top, broad at the base, and the highest and most prominent of the bluffs in that vicinity. It may be seen in clear weather for a distance of 15 to 18 miles.

Split Rock is a slightly projecting head 3.5 miles northward of the northern end of Gold Bluffs; it is named on account of the cut on the northern face.

High Bluff is a slightly projecting head 0.8 mile northward of Split Rock. It is prominent because of an enormous split or chasm on its northern face; at the southern edge of the cut the bluff is 340 feet high.

White Rock, 107 feet high, lies 600 yards northward of High Bluff and 300 yards offshore. Numerous rocks, covered and visible, lie between it and the beach. Its southern face is very precipitous and its western face is steep, sloping northward. It can be distinguished by its color for several miles.

Flint Rock Head, 177 feet high, is a detached rocky head connected with the cliffs by a low sandspit. It is at the southern end of the Klamath River sand beach, 1.8 miles northward of Split Rock. Its southwest face is precipitous. A rock awash lies 0.6 mile northwest from Flint Rock Head and 0.5 mile offshore.

Klamath River mouth is 16 miles southward of Point St. George and 30 miles northward of Trinidad Head. It is a large river draining an extensive mountainous area. The pilings formerly reinforcing the sand spit are practically covered. Local boats carry 2 to 3 feet into the river. The bar changes frequently and local knowledge is essential to make the entrance. The entrance is seldom used, but there are milling operations and small-boat traffic on the river. There are several small wharves and float landings where sport fishing boats berth. Gasoline and water are available.

The coast highway crosses the river at **Klamath,** a small town 2 miles inland. **Requa,** a small village on the north shore of the river just inside the mouth, has a hotel and landings for sport fishing boats.

Red Mountain, 8 miles eastward of the mouth of Klamath River, is visible for about 60 miles in clear weather.

From the mouth of the Klamath River the coast curves northwestward for 3 miles to the mouth of **Wilson Creek.** The cliffs are high, irregular, and jagged, and the hills

above are covered with grass and chaparral. Numerous rocks extend about 300 yards offshore.

A covered rock 0.6 mile offshore is 1.4 miles northwestward of the mouth of Klamath River. A rock, 37 feet high, is 1 mile offshore, 2.6 miles northwestward of the mouth of Klamath River and about 1.5 miles southward of Wilson Creek.

False Klamath Rock, 203 feet high, reddish, and round-topped, is the most prominent rock on this part of the coast. It lies 650 yards westward of the southern point of the small cove into which Wilson Creek empties. **Wilson Rock,** covered 2½ feet, is 0.5 mile west of False Klamath Rock. A rock awash is 0.9 mile northwestward of False Klamath Rock. Numerous covered rocks lie eastward and northeastward of the line from this rock to another rock, 37 feet high, southward of False Klamath Rock.

From False Klamath Rock for 7 miles northward the coast consists of bold rocky cliffs, much broken and bordered by numerous covered and exposed rocks. Beyond these, extending 3 miles to Crescent City, is a broad sand beach backed by flat cultivated land.

Midway Point, 4 miles northward of False Klamath Rock, is bold, rising to a height of 820 feet 800 yards from the beach.

Sister Rocks, a cluster of prominent rocks, 0.5 mile westward of Midway Point, consist of three large and several smaller rocks covering a limited area; the outer one is 69 feet and the inner one 72 feet high.

Chart 5895.—Crescent City Harbor, midway between San Francisco Bay and the entrance to Columbia River, is protected by breakwaters and used by vessels drawing up to 23 feet. Lumber is shipped out, and gasoline and fuel oil are shipped in. Commercial and sport fishing boats operate out of the harbor. **Crescent City** is on the northern side.

Crescent City Light (41°44.7′ N., 124°12.1′ W.), 77 feet above the water, is shown from a 45-foot white tower on a building located on a small islet 200 yards southward of **Battery Point. Round Rock,** 550 yards southward of the west breakwater light, is 45 feet high with deep water close-to. The entrance to the harbor is marked by navigational aids.

Boundary lines of inland waters.—The line established for Crescent City Harbor is described in **82.127,** Chapter 2.

Depths of 20 to 23 feet can be taken into the outer part of the harbor, thence 12 to 18 feet to the lumber wharf on the west side of the harbor, and 10 to 15 feet to Fishboat Harbor in the eastern part.

The west breakwater gives good protection from northwest winds for vessels anchored in the outer harbor, but the harbor is open to the southward. Fishboat Harbor provides excellent anchorage for small craft.

Vessels anchored in the harbor should take precaution against a local southeasterly wind known as the **kick back or back draft,** which frequently blows with considerable violence at night. This wind follows only periods of strong northwesterly winds outside. It usually starts about 9:30 p.m. and dies about midnight.

Caution should be exercised in approaching Crescent City Harbor because of the many rocks and shoals. **Chase Ledge,** covered 21 feet, lies 0.9 mile southward of Round Rock. **Mussel Rock,** only a few feet high, is 0.6 mile southeastward of Round Rock; a rock covered 7 feet, 700 yards to the southward, breaks only in a heavy swell. Other covered rocks extend northward to Whaler Island. Foul ground with many bare and covered rocks extends nearly a mile offshore along the low but rocky coast northwestward of Crescent City Harbor for 3.5 miles to Point St. George. This area should be avoided.

There are three privately owned wharves in the western part of the harbor. The westerly wharf is used for shipping lumber; the other two are in ruins.

Fishboat Harbor is formed by the inner breakwater extending northwestward from **Whaler Island** and the sand barrier from that island to the eastern shore. **Citizens** Dock extends out to a depth of 13 feet. Lumber is shipped from the head of the wharf, and fishing boats use a spur built out near the end. Water is piped to the wharf; gasoline and diesel oil are pumped.

Crescent City Harbor has no facilities for hauling out vessels. Some local boats are beached for minor repairs. Pilots are not available, although tugboats operate from the harbor.

Castle Rock, 2.3 miles northwestward of Crescent City Light and 0.5 mile southward of the southern point of Point St. George, has a rather flat top with a small knob near the eastern edge.

Point St. George is low, with several irregular and rocky hillocks near the beach. The seaward face is about a mile long in a northwesterly direction, with sand dunes and low land immediately behind it. The tree line is about 0.6 mile inland, with a few trees near the southern end of the point. Numerous conspicuous rocks fringe the point up to 0.5 mile offshore. **Brown Rock,** 28 feet high, is near the outer end of the exposed rocks extending northwestward from the point.

St. George Channel, over a mile wide, is clear between the visible rocks fringing Point St. George and the easternmost rocks of St. George Reef. It is frequently used in clear weather by coastwise vessels.

St. George Reef is composed of rocks and covered ledges extending 6.5 miles northwestward and westward from Point St. George. Nine visible rocks are in the group.

St. George Reef Light (41°50.2′ N., 124°22.5′ W.), 146 feet above the water, is shown from a gray tower on a pier on **Northwest Seal Rock,** the outermost rock; a radiobeacon and a fog signal are at the station.

Star Rock, the southeasternmost rock of the group, is 64 feet high. It is 1.7 miles westward of the southwestern tip of Point St. George. Between Star and Northwest Seal Rocks are three rocks, **Hump, Whale,** and **Southwest Seal,** almost in line, varying in height from 18 to 45 feet. Southward of these visible rocks are two covered ledges, **Mansfield Break,** and **Jonathan Rock.** The latter is 2.5

miles northwestward of Star Rock and 3.2 miles southeastward of Northwest Seal Rock. It breaks only in a heavy swell, and not continuously then; deep water surrounds it. Mansfield Break lies 2.3 miles south by east of Northwest Seal Rock and nearly 3.5 miles northwestward of Star Rock. It is about 100 yards in extent with 20 fathoms close-to and around it.

Great Break, 0.5 mile southeastward of Southwest Seal Rock, is about 150 yards in extent. A covered ledge that breaks at low water is 125 yards southwestward of Southwest Seal Rock.

Dragon Channel, which leads northward of Jonathan Rock and between Mansfield Break and Great Break, is not recommended.

East and **Long Rocks** are 2.1 and 1.6 miles, respectively, northward of Star Rock. On this line and 1 mile northward from Star Rock is a rock visible at lowest tides; 0.3 mile southeastward from this rock is a rocky patch covered 15 feet in which a rock covered 5 feet has been reported.

Flat Rock lies nearly midway between Long and Whale Rocks, and about 0.6 mile from the former. **Mussel Rock** is nearly 0.5 mile west by north of Long Rock; a covered ledge showing a breaker is 200 yards northward of the rock. A covered rock that breaks in moderate swells is 330 yards northeastward of Hump Rock.

All the rocks of St. George Reef rise abruptly; when in the vicinity soundings give no warning of their presence. In thick weather the greatest caution should be observed and the reef given a wide berth.

Chart 5702.—For about 10 miles northward of Point St. George, the shores of **Pelican Bay** are composed of sand dunes, with a broad beach extending to the mouth of **Smith River. Lake Talawa** and **Lake Earl** are surrounded by low marshly land behind this stretch of dunes.

A small rock about 10 feet high is 1.8 miles southward of the mouth of Smith River and nearly 0.5 mile offshore. A cluster of three low rocks is nearly a mile offshore and 0.9 mile north-northeastward of the 10-foot rock.

Chart 5896.—From Smith River for 3.2 miles to the California-Oregon boundary, the coast is composed of low rocky cliffs, bordered by numerous rocks and ledges, covered and awash, and backed by a low narrow tableland. Several prominent rocky knolls rise from 100 to 200 feet above this tableland.

Pyramid Point, a rocky knoll 213 feet high, marks the northern point of Smith River.

Prince Island, of small extent and 171 feet high, lies 0.1 mile offshore abreast Pyramid Point. **Hunter Rock,** 177 feet high, double-headed and somewhat smaller, is 0.3 mile northward of Prince Island. Several other smaller rocks are in the vicinity.

Cone Rock, 1.3 miles northward of Prince Island and 0.6 mile offshore, is the most prominent of the visible dangers in this vicinity. It is 68 feet high and of small extent.

9. CHETCO RIVER TO COLUMBIA RIVER, OREGON

Chart 5896.—From the California-Oregon boundary for 3.8 miles to Chetco River, the coast is composed of low rocky cliffs, bordered by numerous rocks and ledges, covered and awash, and backed by a low narrow tableland. Several prominent rocky knolls rise from 100 to 200 feet above this tableland. Due to the numerous dangers, the coast should not be approached closer than 1.5 miles.

Chetco Cove, 15.5 miles northward of Point St. George, affords some protection from northwesterly winds, but is exposed in southerly weather. There are numerous visible and covered rocks fringing the shore of the cove and its approaches. The entrance to **Chetco River** is protected by two stone jetties and navigational aids mark a channel to **Brookings** basin, 500 yards above the mouth. In 1962 the controlling depth was 5 feet on the range line to the basin, thence about 2 feet to the highway bridge 0.6 mile above the mouth. With local knowledge, 6 feet or better can be taken to the docks in the basin. The highway fixed bridge has a clearance of 23 feet.

Lumber is shipped out of Brookings basin and some fish are brought in by local fishermen. Gasoline, water, lubricants, and some marine hardware and groceries are available; there are no repair facilities. See Appendix **for storm warning display.**

From Chetco Cove for 4.5 miles to Cape Ferrelo, the coast is composed of high broken cliffs, bordered by numerous rocky islets and ledges extending, in some cases, over 0.5 mile offshore.

Goat Island, 17.5 miles northward of Point St. George and 500 yards offshore, has deep water off its western and southwestern faces, but rocks and foul ground extend 200 yards southward from the southeastern point. The island is readily identified; its profile closely resembles that of Prince Island off Pyramid Point.

Cape Ferrelo, 20 miles northward of Point St. George, is the prominent headland northward of St. George Reef and, though not projecting seaward to any extent, is conspicuous because of its bold, rugged face. Several rocks and islets lie up to 0.5 mile directly off the cape.

From Cape Ferrelo for 9.5 miles to Crook Point, the coast is very rugged and rocky, with several large and prominent islets and reefs extending well offshore. In some cases, these form anchorages for small vessels in northerly weather.

Whalehead Island, the outer of two rocky islets 2.3 miles northward of Cape Ferrelo, is 107 feet high. The inner of the two islets is 128 feet high. A rock awash lies 800 yards southward of the highest point of the island.

A rugged cliff from 200 to 300 feet high is 3.3 miles northward of Cape Ferrelo. The face is about a mile in length, and behind it rises a treeless triple-headed hill to heights of 700 to 800 feet.

Leaning Rock, 49 feet high, lies 0.5 mile offshore and 3.5 miles northward of Whalehead Island. It has a perpendicular face on its northwestern side and slopes gradually southeastward. Several other rocks are in its vicinity.

Between Whalehead Island and Crook Point are two prominent grassy areas in the forest near the crest of the hills about 2 miles apart and situated at an elevation of nearly 2,000 feet; the southern one is known as **Rocky Prairie.**

Yellow Rock, 84 feet high, lies 4.5 miles northward of Whale head Island and 0.5 mile offshore. The rock is yellowish in color and can be recognized from 4 miles offshore.

Bosley Butte, 8.5 miles northeastward of Cape Ferrelo, shows above the coast ridges from the westward and northwestward as flat-topped with two summits separated by a slight depression. The northeasterly summit is rounded and somewhat larger, but is slightly lower than the eastern summit.

Mack Arch is a double-headed, rocky islet 0.8 mile offshore, 1.5 miles southward of Crook Point and 8 miles northward of Cape Ferrelo. The western head is 231 feet high and the eastern a little lower; both are black to near the summits which are generally white from bird droppings. The arch, about 100 feet high, is under the eastern summit and shows prominently from southward. A rock awash lies 125 yards southward of the eastern point.

The bight to the east-southeastward of Mack Arch has been used as a temporary anchorage during moderate northwesterly weather. The rocks and reefs break the swell. In approaching the anchorage, pass to the southward of Mack Arch about midway between it and Yellow Rock. Anchor in 11 fathoms, sand bottom, with Mack Arch bearing 296° and Yellow Rock bearing 155°. No breakers have been observed, but caution should be exercised as the place has not been closely surveyed.

Mack Reef extends from Mack Arch to Crook Point and comprises many rocks, visible or sunken, varying in height from awash to 125 feet. From southward these rocks stand out conspicuously when seen against the white sand dunes northward of Crook Point. Mack Arch, on account of its size and height, is the most prominent.

Mack Arch Cove lies immediately eastward of Mack Reef and affords fair shelter in northwesterly weather in 6 to 7 fathoms, sandy bottom. In entering from southward, pass eastward of Mack Arch, giving it a berth of about 150 yards, but taking care to avoid the rock 125

yards southward of its eastern point. Then bring the 125-foot rock, the highest of the northern part of the reef, to bear 352° and steer for it on that bearing until up to the anchorage abreast the group of rocks 0.5 mile northward of Mack Arch.

Crook Point is moderately low, but terminates seaward in a rocky knoll 175 feet high, with a slight depression immediately behind it. The rocks close to the point often show up during moderately thick weather, several being of very noticeable pinnacle formation.

From the vicinity of Crook Point to the mouth of the **Pistol River** are sand dunes which show up prominently in clear weather and distinctly mark this section. In thick weather these dunes cannot be readily distinguished. From the mouth of the river to Cape Sebastian are numerous rocks and rocky islets extending 0.3 mile offshore, reaching in some cases a height of 150 feet. The Pistol River bar opens in the rainy season; its location varies from year to year.

Hunters Cove, a small, contracted anchorage under the southeastern face of Cape Sebastian, is formed partly by the cape and partly by **Hunters Island** in the entrance. The island is 0.2 mile in extent, rocky, flat-topped, and 113 feet high. Shoal water extends from it eastward to the beach. The cove is used occasionally by launches and small craft. During strong northwesterly weather the sea at the entrance is rather lumpy for small boats. With moderate southwesterly weather a heavy sea piles up across the entrance between the cape and Hunters Island.

Chart 5951.—Cape Sebastian, 33.5 miles northward of Point St. George, is conspicuous from either northward or southward. It is the seaward termination of a ridge transverse to the coast, and rises abruptly from seaward to a height of 694 feet, with a depression behind it, and then more gradually to a height of about 2,000 feet. The seaward face is precipitous and broken, and has a few trees; southward the lower part is grass covered. A rock covered 1¾ fathoms that seldom breaks is 0.5 mile offshore, 0.9 mile northwestward of the western extremity of the cape.

From Cape Sebastian for 6 miles to the mouth of Rogue River, the coast is considerably broken, quite rugged, low in the vicinity of the beach, and has a few outlying rocks.

The outer of three exposed rocks off the entrance to **Hunter Creek,** 3.7 miles northward of Cape Sebastian, lies nearly 0.5 mile offshore.

Rogue River, 6 miles northward of Cape Sebastian, is an important sport-fishing stream. Lumber is shipped from **Gold Beach** on the south side of the river near the mouth. **Wedderburn,** on the opposite side of the river from Gold Beach, has several float landings with depths up to 5 feet alongside.

The entrance to Rogue River is protected by stone jetties; buoys mark the approach. In June 1962, the controlling depth in the dredged channel to Gold Beach was 8 to 13 feet with local knowledge. Gasoline and some marine hardware and groceries are available.

A concrete arch highway bridge across Rogue River, 0.8 mile above the mouth, has a fixed span with a clearance of 30 feet. The bridge is prominent when off the mouth of the river. Special logging regulations are given in **207.655,** Chapter 2.

The northern head at Rogue River entrance that reaches a height of 700 feet a mile northward of the river, the marked depression in the coast range made by the river valley, and the rocks of Rogue River Reef are prominent from seaward.

Rogue River Reef, extending over 4 miles northwestward from Rogue River entrance, includes many visible and covered rocks; because of the broken bottom vessels should stay over 5 miles offshore when passing this area. A 0.5-mile wide channel separates the reef from the beach, but it is not safe to use without local knowledge. **Northwest Rock,** 4 miles northwestward of Rogue River entrance, is the outermost visible rock of the reef. A rock, covered 2½ fathoms, is 0.3 mile westward of Northwest Rock. **Needle Rock,** 1.1 miles southeastward of Northwest Rock, is the most prominent of the rocks in the reef; the needle is on the southern side.

Northward of Rogue River the coast trends northerly for 10 miles and then northwestward to Cape Blanco. The mountains are high, irregular, dark, and covered with chaparral. The beach is bordered by numerous rocks for 5 miles, then is comparatively clear with the exception of Orford and Blanco Reefs.

A group of covered and visible rocks, 1 mile long and 0.5 mile wide, lies 5 miles northward of Rogue River and nearly 2 miles offshore; these rise abruptly from 12 fathoms. **North Rock,** 7 feet high, is the largest and is nearest the beach. A rock, covered 1¼ fathoms, lies about 0.6 mile northwestward of North Rock.

The channel between Rogue River Reef and the mainland, and North Rock and the mainland, is sometimes used by coastwise freighters in clear weather. This channel should not be attempted by strangers.

Brushy Bald Mountain, nearly 9 miles northeastward of Rogue River entrance and 3 miles inland, shows up in hazy weather as a flat rounded peak, with a gentle slope from a westerly and southerly direction.

Sisters Rocks are a group of three rocky islets 10.5 miles northward of Rogue River entrance. The smallest, 0.8 mile offshore, is the outermost. There is fairly smooth water in northwesterly weather under the lee of the largest islet.

Colebrooke Butte, 2 miles eastward of Sisters Rocks, appears from the westward as a cone with gentle sloping sides. The upper part usually shows against the skyline and is readily recognized. From the southward, it shows as a rounded peak which resembles Brushy Bald Mountain, though it is somewhat lower. The northern part of the summit is tree-covered and dark green, and the southern part is grass- and brush-covered and light green. The slopes are timbered except for the lower part of the seaward slope which is bare and brown.

Lookout Rock, 2.3 miles northward of Sisters Rocks, is a prominent projecting cliff, with a marked depression behind it. The seaward face is precipitous.

Bald Mountain, 3.2 miles northeastward of Lookout Rock, appears from offshore as an irregular knob at the

northwesterly end of a long ridge. **Rocky Peak,** on the southeastern end of the ridge, is a sharp conical peak. From a southwesterly direction, three peaks or knobs show; from a north-northwesterly direction, two peaks show almost in range. These peaks were used by the early navigators as a landfall for Port Orford in coming from the northward.

Prominent **Humbug Mountain,** 3.3 miles northward of Lookout Rock and 4 miles southward of Port Orford, is conical in shape, and its seaward face is steep and rugged.

Chart 5952.—Island Rock, 1.3 miles off the seaward face of Humbug Mountain, is flat on top. A needle rock is 200 yards off its northwestern end. These rocks are prominent when approaching Port Orford from southward. Except for two small rocky patches, covered 6¾ and 10 fathoms, within 0.5 mile of the north end of Island Rock, there is deep water around these islands and between them and the beach.

Redfish Rocks are a group of islets covering an area 0.5 mile square, lying 2 miles northward of Island Rock and nearly 1 mile offshore. They are six in number and range from 10 to 140 feet in height. Many covered rocks lie within this area.

Port Orford, 6.5 miles southward of Cape Blanco and 19 miles northward of Rogue River, is a cove that affords good shelter in northwesterly weather, but is exposed and dangerous in southerly weather. It is easy of access and is probably the best natural northwesterly lee northward of Point Reyes.

The town of **Port Orford,** on the north side of the cove, is the home of the famous yellow cedar. Some lumber is shipped out, but most of it is trucked to Coos Bay.

The Heads, forming the western point of the cove, appear from southward as a long ridge with three knobs. The inner two are slightly higher and covered with trees. **Tichenor Rock** lies 175 yards southward of The Heads. The white Coast Guard lookout tower on The Heads is prominent from southward and is reported to be mistaken at times during the day for Cape Blanco Light tower. The white tank on the summit of The Heads shows just clear of the nearby trees; it also resembles Cape Blanco Light tower when observed from far offshore.

Klooqueh Rock, 0.3 mile off the northwestern face of The Heads, is black and conical in shape. It is prominent, especially when coming from the northwest inside Orford Reef. Rocky ledges are between this rock and shore.

Anchorage may be had in about the center of Port Orford in 6 to 10 fathoms, sand bottom. A bell buoy is 0.5 mile southward of Tichenor Rock. Small craft may anchor closer to The Heads where better protection is afforded against the northwesterly winds which sweep with considerable force through the depression at the head of the cove.

Battle Rock, in the northern part of the cove close to shore, is high, narrow, and black; it is detached only at extreme high tides. Visible and covered rocks extend up to 0.5 mile from shore around the cove, but a passage with 2½ to 5 fathoms is available through the center of the cove to the wharf easterly of **Graveyard Point.** A rock, covered 5 feet, and usually marked by kelp, is 55 yards eastward of the wharf.

Depths of 15 feet are alongside the outer eastern face of the wharf; depths are shoaler inshore. Gasoline, diesel oil, and water are piped to the wharf; fishing boats are lifted to cradles on the wharf by a 15-ton hoist. Some groceries are available in town; marine hardware can be ordered from Coos Bay, 51 miles by highway.

From The Heads for 6.5 miles to Cape Blanco, the coast extends in a general north-northwesterly direction. Northward of The Heads the shore is a narrow sand ridge, rising at one point to 160 feet, covered with grass, fern, and brush, and ending abruptly nearly 3 miles from The Heads at the edge of the Elk River Valley. Northward of this point are sand dunes extending to the mouth of **Elk River,** a small, unimportant stream. Beyond the mouth of Elk River to Cape Blanco, the coast consists of vertical cliffs, wooded to the edge, and in some places over 150 feet high.

Orford Reef, from 2 to 5 miles offshore between The Heads and Cape Blanco, is composed of a group of irregular rocks up to 149 feet high and ledges, many of which are awash or show a break. Kelp extends from Orford Reef to within 1.3 miles of the shore. A lighted whistle buoy, 6.5 miles southwestward of Cape Blanco, is the guide for clearing this reef.

Fox Rock and **Southeast Black Rock,** 1.3 miles apart, almost 5 miles southwestward of Cape Blanco, are the southernmost rocks of Orford Reef; they usually show a heavy break. **Northwest Rock,** 3 miles southwestward of Cape Blanco, is the northernmost visible rock of Orford Reef, although several rocks, covered 5 fathoms, are 1.2 miles northeastward of Northwest Rock.

Blanco Reef, extending 1.5 miles southwestward from Cape Blanco, consists of numerous rocks and ledges, some of which are marked by kelp. **Black Rock,** 1.2 miles southwestward of Cape Blanco Light, is the southernmost visible rock of Blanco Reef. **Pyramid Rock,** 1 mile westward of the light, is the northernmost visible rock of the reef, although a rocky patch uncovers about 3 feet 0.4 mile to the northward. Rocky patches, covered ½ to 6 fathoms, extend from 0.5 mile southwestward of Black Rock to 0.4 mile westward of Pyramid Rock.

In clear weather small vessels with local knowledge sometimes use the passage inside Orford Reef and between Orford Reef and Blanco Reef.

Cape Blanco projects about 1.5 miles from the general trend of the coast. It is a small bare tableland, terminating seaward in a cliff 225 feet high, with low land behind it. A large high rock lies close under the southern side of the cape. From seaward the cape is not prominent, but from northward or southward, it appears like a moderately low bluff islet. The group of buildings at Cape Blanco is very prominent.

Cape Blanco Light (42°50.2′ N., 124°33.8′ W.), 245 feet above the water, is shown from a 59-foot white conical tower near the center of the flat part of the cape;

a radiobeacon is at the station. The tank and lookout tower at The Heads should not be mistaken for the light tower.

Numerous covered and visible rocks extend 0.5 mile or more northwestward from the cape.

Gull Rock, 1 mile northward of Cape Blanco Light, is surrounded by covered rocks. Its seaward face is black and rugged, and the summit has two knobs, the higher being to the southward. A rocky patch, covered 3 fathoms, lies 0.5 mile westward of Gull Rock.

Castle Rock, 1.5 miles northeastward of Cape Blanco Light and 300 yards off the mouth of **Sixes River,** rises abruptly from the sea and is readily made out 10 miles to seaward. Many low rocks and ledges are within 400 yards. Several rocky islets are to the west and northwest.

Blacklock Point is a precipitous rocky point 2.5 miles northward of Cape Blanco. The cliff is 157 feet high. A sharp high point, bordered by rocks, stretches out nearly 300 yards. A narrow curved line of rocks extends 0.8 mile west-southwestward from the point. A rock that breaks in heavy weather is 1 mile northwestward of the point. Rocky patches, covered 4 fathoms, are within 1.3 miles of the point in a westerly and northwesterly direction.

Chart 5802.—From Cape Blanco for 112 miles to Yaquina Head, the coast is remarkably straight and trends in a north by east direction. It differs considerably from the coast to the southward. The coastal mountains are much lower, the difference being more marked because of the high mountains inland. The shore consists of high yellow sand dunes and cliffs broken by bold rocky headlands of moderate height and backed by low pine-covered hills. There are few outlying dangers, the outermost being Blacklock Point, Coquille Rock, and Cape Arago.

From Blacklock Point the shore continues rocky with cliffs gradually decreasing in height for 1.5 miles northward, thence for about 11 miles the shore is a broad sandy beach backed by dunes and long narrow lakes. The tree line is at an average distance of 0.2 mile from the sea. From the end of the sand beach for 2 miles to the mouth of Coquille River, the shore again consists of rocky cliffs, 40 to 80 feet high, with several outlying rocks as much as 0.5 mile from shore. Covered dangers extend 1.6 miles westward from Coquille Point. The land directly behind this stretch of coast is comparatively flat and wooded, rising to heights of 1,000 feet in 2.5 to 3 miles.

Chart 5971.—Coquille River, 18 miles northward of Cape Blanco, is used for the shipment of lumber, railroad ties, and logs. The principal port is **Bandon,** on the southern bank of the river, 0.8 mile above the entrance.

Coquille Point is 0.6 mile southward of Coquille River entrance. Several rocky islets extend 0.5 mile off the point and rocks showing breakers in any swell extend 1.2 miles westward and a mile northwestward of the point. **Coquille Rock,** 1.6 miles northwestward of the point, is covered 28 feet and breaks in heavy weather.

A long, low area of shifting dunes is northward of the Coquille River entrance. The conical tower and dwelling of an abandoned lighthouse is near the inner end of the north jetty.

The entrance to Coquille River is protected by jetties; a marked dredged channel leads to the port facilities at Bandon. In April 1962, the controlling depth was 11½ feet to Bandon. The channel is subject to frequent change, and the deepest water is not always on the entrance range. Local knowledge is essential when the bar is rough. The reported depth above Bandon is about 6 feet to Coquille, 21 miles above the entrance.

The 375-foot long port dock at Bandon has a reported depth of 15 feet alongside the face. Lumber vessels occasionally load up to drafts of about 14 feet and then proceed to Coos Bay to finish loading. A small-craft basin has moorings for 150 boats.

Some groceries and marine hardware are available in Bandon. Water is piped to the wharves, but gasoline and diesel oil must be delivered by truck. There is a machine shop in Bandon; small boats have to go to Prosper for hauling out.

Coquille River, above Bandon, is used occasionally for rafting logs between the mills on the river and the railroad at Coquille. A highway bridge, 3 miles above the entrance, has a lift span with clearances of 28 feet down and 74 feet up; a power cable east of the bridge has a clearance of 72 feet. Special regulations for logging operations on the North Fork of Coquille River are given in **207.660,** Chapter 2.

Prosper, 4 miles above Coquille River entrance, is a deserted area of old piling and ruined lumber docks. A marine railway can haul out boats up to 45 feet in length and 10 tons.

A power cable across Coquille River, 18.5 miles above the entrance, has a clearance of 72 feet.

Coquille, 21 miles above the entrance, is the distributing center for several agricultural communities of the river valley and has railway connections with the interior.

Chart 5802.—Northward of the entrance to the Coquille River the sand dunes extend for about 4 miles and are then succeeded by cliffs. **Fivemile Point,** 6 miles northward of the river entrance, is a rocky cliff 60 feet high with a cluster of rocks, 10 to 40 feet high, extending more than 0.3 mile offshore.

Northward of Fivemile Point the coast consists of cliffs, 40 to 80 feet high, which rise to heights of 100 to 250 feet 2 miles southward of Cape Arago and are cut by deep gulches, named the **Seven Devils.** Numerous rocks of varying shapes and sizes border the beach.

South Cove, immediately under the southern point of Cape Arago, can be used as an anchorage in summer by small vessels with local knowledge.

Cape Arago, 29 miles northward of Cape Blanco, is an irregular jagged point projecting about a mile from the general trend of the coast. There are no high mountains immediately behind the cape, and it is conspicuous only when the mountains in the interior are obscured. The seaward face of the cape, 2.5 miles long in a northerly direction, is a narrow sparsely wooded tableland 50 feet high, with rugged and broken cliffs and outlying rocks

of the same height as the cliff. Immediately off the cape are reefs extending northwestward for about a mile. A small cove near the northern end, inside the reefs, is sometimes used by small boats with local knowledge.

Chart 5984.—Cape Arago Light (43°20.5′ N., 124°22.5′ W.), 100 feet above the water, is shown from a 44-foot white octagonal tower attached to a building on a rocky, partially wooded island close inshore, 2.5 miles northward of the cape. A radiobeacon and fog signal are at the station. See Appendix for **storm warning display.**

Baltimore Rock, 0.6 mile northwestward of Cape Arago Light, is covered 11 feet and usually breaks. It is the outermost rock of a covered ledge extending northwestward from the lighthouse island. A bell buoy is 450 yards northward of the rock.

Coos Head, 229 feet high, 1.8 miles east-northeastward of Cape Arago Light, is on the south side of the entrance to Coos Bay. The cliffs are about 100 feet high and terminate in several small rocky points with sand beaches between them. A Coast Guard station is on the southern point at the entrance 0.3 mile eastward of Coos Head. The buildings of the U.S. Naval facility for oceanographic research are conspicuous on the bluffs just southwestward of Coos Head.

Coos Bay, 33 miles northward of Cape Blanco, is used as a harbor of refuge and can be entered at any time except in extreme weather. From the entrance, the bay extends northeastward for 7 miles with widths of 0.3 to 1 mile, then bends southeastward for 4 miles into a shallow basin over 1.5 miles wide, surrounded by marshland and intersected by several sloughs.

Prominent features.—Coos Head, Umpqua River Light, and Cape Arago Light are good guides to the entrance. The sand dunes northward toward Umpqua River are prominent. The entrance to the bay has two jetties extending about 1,200 yards seaward from the shoreline. A lighted whistle buoy is 1.8 miles west-northwestward of the entrance. The channels are marked with lighted ranges, lights, buoys, and daybeacons.

Channels.—In 1962 the controlling depths in the dredged channels were: 30 feet on the bar, thence 26 feet to the turning basin at the city of Coos Bay; 20 feet in the Isthmus Slough to Millington with local knowledge; and 9 feet to the small-boat basin north of Charleston.

Anchorage can be had almost anywhere in the bay below the railroad bridge, depending upon the draft. Outside the bay vessels have ridden out southeasterly gales by anchoring close to Cape Arago in 30 to 36 feet, but this is dangerous if the wind shifts to the southwest.

Dangers.—Guano Rock, on the southern side of the entrance channel and 280 yards northwestward of Coos Head, uncovers only at extreme low water.

A submerged jetty extends 500 yards off the east shore of Coos Bay just inside the entrance, 0.8 mile northeastward of Coos Head. In entering with a strong northwesterly wind, large vessels have difficulty in making the turn and may find themselves being set toward the submerged jetty.

Bridges.—A railroad bridge across Coos Bay, 7.5 miles above the entrance, has a swing span with a clearance of 12 feet. A fixed highway bridge, 8.1 miles above the entrance, has a clearance of 123 feet across the main channel. A power cable, 100 yards westward of the fixed bridge, has a clearance of 167 feet.

Drawspan regulations for bridges in Coos Bay are given in **203.720,** Chapter 2.

Tides.—The mean range of tide at Coos Bay is 5.6 feet. The range between mean lower low water and mean higher high water is 7.3 feet. A range of about 12 feet may occur at the time of maximum tides.

Currents.—A short series of current observations in the entrance taken during the month of September indicated a velocity of about 2 knots. The greatest observed ebb velocity was a little over 3 knots. Predictions for the entrance may be obtained from the Tidal Current Tables. *During long runouts an ebb current of 5 knots has been reported at Guano Rock.*

See Appendix for **storm warning displays.**

Routes.—Vessels should make sure of the entrance range before standing close in. There is usually a current sweeping either northward or southward just off the jetties, and this current should be guarded against. The entrance ranges should be watched carefully until clear of all dangers. The southerly current is often encountered during the summer. With strong southerly winds during the winter, the current sometimes sets to the northward.

Approaching from any direction in thick weather, great caution is essential. The currents are variable and uncertain. Velocities of 3 to 3.5 knots have been observed offshore between Blunts Reef and Swiftsure Bank, and greater velocities have been reported. The most favorable time for crossing the bar is on the last of the flood current, and occasionally it is passable only at this time.

Pilotage.—Pilots are available and can be called by radio, directed to the Coos Bay Pilots' Association.

Quarantine regulations of the U.S. Public Health Service are enforced. Vessels with communicable diseases on board should not pass Empire until the quarantine officer has been notified and permission granted. An outpatient office is in Coos Bay.

Customs.—Coos Bay is the port of entry for southern Oregon; marine documents are issued. Vessels subject to customs usually proceed to the dock.

Supplies.—Fuel oils, water, marine hardware, and groceries can be obtained at Coos Bay and North Bend.

Repairs.—Machine shops are available. There are several marine ways in the area, the largest of which has a capacity of 300 tons and can haul out boats up to 125 feet in length and 10 feet in draft.

Communication is by rail, truck, bus, and air. No passenger vessels enter the port, although a few passen-

691-231 O—63——11

gers occasionally are carried on lumber ships. There is also considerable local traffic in smaller vessels to points north and south.

South Slough, shoal and navigable only by small boats, extends 4 miles southward from its junction with Coos Bay near the entrance.

A small-boat basin, operated by the port of Coos Bay, is 0.3 mile northward of **Charleston,** across the slough from **Barview.** The basin is used by commercial and sport fishermen; water and electricity are obtainable at the floats, and launching ramps for small boats are available.

The highway bridge over South Slough, 0.5 mile southward of the entrance, has a swing span with a clearance of 10 feet. A power cable southward of the bridge has a clearance of 76 feet.

The western shore of Coos Bay as far as the bend is formed by a sandspit covered with dunes, partly wooded, and in some places as much as 90 feet high. On the eastern shore and above the bend are low rolling hills covered with timber.

Empire is on the eastern shore of the bay, 4 miles above the entrance. The sawmill wharf has a 300-foot berthing space with 17 feet alongside. There are several prominent oil tanks. A private dock, westward of the tanks, has loading facilities for lumber and oil. At the pulp mill, 1.5 miles below Empire, a trestle leads to a loading wharf with a frontage of 500 feet and 20 feet alongside. The southward corner of the wharf is marked by a light. The pilot boat is usually berthed here.

Haynes Inlet and North Slough, which join the bay through a common entrance on the northern side, are navigated by small boats. A causeway with a fixed bridge having a clearance of 18 feet joins the state highway fixed bridge over Haynes Inlet; the latter has a clearance of 29 feet. The power cable over the common entrance of the two streams has a clearance of 67 feet.

Coos Bay and North Bend form practically one continuous city extending along the shore from North Point to the mouth of Coalbank Slough. The waterfront between these two towns is called **The Strip** locally. Oil docks and lumber mills are along the waterfront.

North Bend, 9.5 miles above the entrance, is a prosperous town with sawmills and factories. Considerable lumber is shipped from here.

Coos Bay, 12 miles above the entrance, is the principal city in the bay. It is the distributing center for a considerable section of the country devoted to lumbering, dairying, and agriculture. There are ample wharfage facilities with depths of 9 to 30 feet.

Three sloughs empty into Coos Bay between the city of Coos Bay and Coos River. **Coalbank Slough** is unused. **Isthmus Slough** is used for logging operations to **Millington.** The highway bridge across the slough has a bascule span with a clearance of 18 feet. The power cable, 0.9 mile south of the bridge, has a clearance of 150 feet. **Catching Slough** is navigable for several miles by light-draft vessels and is used mainly for logging operations. The highway bridge across the mouth has a 50-foot swing span with a clearance of 11 feet. The power cables for 1.5 miles below the bridge have a least clearance of 58 feet; other cables upstream have a least clearance of 12 feet.

Coos River empties through two channels into the bay at its head. The northern unmarked channel follows the eastern side of the bay and empties abreast of North Bend. **Marshfield Channel,** marked by a lighted range and lights, crosses the flats and empties abreast the city of Coos Bay.

Coos River divides at a point 3.2 miles above **Graveyard Point** into **South Fork** and **Millicoma River.** A highway bridge across the river, 0.9 mile above Graveyard Point, has a lift span with clearances of 28 feet down and 54 feet up. **Allegany,** 7.5 miles above the confluence, is the head of navigation on Millicoma River. **Dellwood,** 8.2 miles above the confluence, is the head of navigation on South Fork.

The controlling depth in Coos River is about 4 feet to the junction of Millicoma River and South Fork, thence 2 to 3 feet to the head of navigation on each waterway.

A fixed highway bridge across South Fork, 0.7 mile above the confluence, has a clearance of 39 feet. Special regulations for logging in the tidal section of South Fork are given in **207.663,** Chapter 2.

Chart 5802.—From Coos Bay for 19.5 miles to Umpqua River, the coast consists of sand beaches and dunes backed by moderately low hills. The mouth of **Tenmile Creek** is 13.7 miles northward of Coos Head.

Chart 6004.—Umpqua River is entered 20 miles northward of Cape Arago Light. Considerable lumber, sand, gravel, crushed rock, fish, and farm and dairy produce are shipped, and general merchandise is received. The port of entry is at Coos Bay.

The southern point at the entrance to the river is marked by sand dunes, partly covered with trees, that reach elevations of 300 feet. About a mile below the entrance is a bright bare spot in the dunes that shows prominently among the trees. Shifting sand dunes about 100 feet high are on the spit on the north side of the entrance.

Umpqua River Light (43°39.8′ N., 124°11.9′ W.), 165 feet above the water, is shown from a 65-foot white conical tower on the southern entrance point. Trees surround the light, but the lantern shows over the tops. A Coast Guard station is near the light.

The entrance to the river is protected by jetties. The south jetty extends 1,200 yards seaward from the shoreline. About 350 yards of the outer end is submerged; a seasonal gong buoy is 400 yards off the end. The north jetty extends 1,100 yards seaward from the shoreline. A lighted whistle buoy is 0.8 mile westward of the end of the north jetty. The channels are marked with lighted ranges, lights, and buoys. The channel over the bar is reported to be shoalest usually during September. Later in the season, the river cuts a deeper channel through the bar.

A Federal project provides for depths of 26 feet through the entrance and thence 22 feet to Gardiner and Reedsport, but depths over the bar are usually about 21 feet, and the

controlling depths thence to Gardiner and Reedsport are usually not over 15 feet.

See Appendix for **storm warning displays.**

Pilotage and towage.—Pilots can be arranged for by radio. There are several diesel tugs available for work on the bar.

Supplies.—Groceries, water, gasoline, and fuel oil for launches may be obtained at Reedsport.

Repairs.—A repair yard at Reedsport can hoist craft up to 250 tons, provided the length is not over 99 feet; general repairs are made to hulls and machinery. The shop can machine shafts up to 28 inches in diameter and 8 feet in length. In 1962, this firm was completing a drydock across the river.

Winchester Bay, locally referred to as "Salmon Harbor," is a small cove on the eastern bank of Umpqua River, 1.5 miles above the entrance. **Ork Reef,** a patch of rocks and sand covered 3½ feet, is near the northern end of the bay. A breakwater on the western side of the bay makes it an excellent harbor for small craft. The controlling depth in the entrance channel is about 10 feet; the north side of the entrance channel has shoaled to less than 6 feet. A fish wharf with a cold storage and ice plant on the outer end is here. Float landings are available for commercial and sport fishing. Water, electricity, gasoline, and fuel are available, as well as launching ramps for small boats. The village of Winchester Bay is a fishing resort.

Gardiner, on the northeastern bank of the river, 8.5 miles inside the entrance, is the site of a large lumbermill. In 1962, construction was underway on a large papermill at Gardiner, including a dredged channel alongside the property.

Reedsport, on the southwestern bank of the river, 10 miles inside the entrance, is a station on the railroad and the principal town on the lower river. Considerable lumber is shipped by the two sawmills. The port wharf has 23 feet alongside the loading face. Lumber vessels load to a maximum draft of 18½ feet.

The highway bridge, crossing the river at the lower end of the turning basin at Reedsport, has a swing span with a clearance of 29 feet. Just west of the bridge is a power cable with a clearance of 152 feet; the least clearance of cables above the highway bridge is 95 feet. The railroad bridge, 500 yards above the highway bridge, has a swing span with a clearance of 16 feet. Drawspan regulations for these bridges are given in **203.725,** Chapter 2.

A cutoff channel 2 to 4 feet deep, marked by two lights across the flats northwesterly from Bolon Island, is a nearly straight passage between Reedsport and Gardiner. A lumber dock is on the southwest end of **Bolon Island.**

At high tide Umpqua River is navigable by vessels of 6-foot draft to **Scottsburg,** 14.8 miles above Reedsport.

Scholfield Creek enters Umpqua River northward of Reedsport. A fixed highway bridge with a clearance of 20 feet crosses the creek 0.9 mile above the mouth. A fixed railroad bridge with a 30-foot span clearance of 16 feet crosses the creek 2 miles above the mouth.

Smith River enters Umpqua River from the northeastward at Reedsport. The controlling depth is about 5 feet for 5 miles above the mouth, thence 2 feet to **Sulphur Springs Landing,** 18 miles above the mouth. The highway bridge, 2.5 miles above the mouth, has a retractile span with a clearance of 22 feet.

Chart 5802.—From Umpqua River for 21 miles to Siuslaw River, the coast is straight and consists of sand dunes broken only by the mouths of **Threemile Creek, Tahkenitch Creek, Siltcoos River,** and the stream from **Cleawox Lake.**

Chart 6023.—**Siuslaw River** is entered 42 miles northward of Cape Arago Light and 7.5 miles southward of Heceta Head Light. The river has some logging operations and finished lumber is barged to Pacific ports. The port of entry is at Coos Bay.

Cannery Hill, on the east side of Siuslaw River 1 mile above the entrance, is wooded and prominent from offshore. The entrance to the river is protected by jetties and navigational aids mark the channel to a mile above Florence. In 1962 the controlling depth was 11 feet over the bar, thence 8 feet to Cushman, 6.5 miles above the mouth. The bar is narrow and the depths vary greatly because of storms and freshets.

Light-draft vessels can go to **Mapleton,** 17 miles above the mouth, but the channel is narrow and crooked.

Florence is a small town on the northern bank of the river 4 miles inside the entrance. Pilots and tugs are available. There are a port dock and a fish dock; fish are shipped by truck. Gasoline, oil, water, and some groceries are obtainable. Minor repairs can be made. See Appendix for **storm warning display.**

Just east of the port dock is a small-boat basin locally known as Holiday Harbor. Launching ramps and moorage are available for pleasure craft. Electricity, water, gasoline, and fuel can be obtained.

Glenada is a small town on the southern bank of the river opposite Florence. The river is crossed here by a double-leaf bascule highway bridge with a clearance of 17 feet. A power cable with a clearance of 88 feet crosses the river 1 mile above the bridge.

Cushman, on the northern bank of the river, 2.5 miles above Florence, has lumber and shingle mills. The products from these mills are shipped by rail and barge. The marine ways here can handle craft up to 25 tons. The railroad bridge across the river, 1 mile above Cushman, has a swing span with a clearance of 15 feet.

Operating regulations for bridges on the Siuslaw River are given in **203.730,** Chapter 2.

Chart 5802.—From Siuslaw River for 7.5 miles to Heceta Head, the coast is composed of sand dunes that are quite conspicuous in contrast with the dark trees partly covering them.

Heceta Head, 28.5 miles northward of Umpqua River Light, has a seaward face 2.5 miles long with nearly vertical cliffs 100 to 200 feet high. The summit of the head, which reaches an elevation of 1,000 feet in 0.5 mile from the cliffs, is covered with grass and a few pines. A sharp

black conical rock, 180 feet high, marks the extreme western and northern part of the head, and is easily made out from either northward or southward. **Cox Rock,** close to the southern part of the head, is conical and usually white on top with bird droppings.

Heceta Head Light (44°08.3′ N., 124°07.6′ W.), 205 feet above the water, is shown from a 56-foot white conical tower on a bench cut in the high bluff near the western extremity. Because of the high bluff northward of the light, vessels from northward will not make out the tower or buildings until abreast the station.

Heceta Bank, 70 miles north by west of Cape Blanco and 30 miles offshore west of Heceta Head, covers an irregular area about 30 miles long and 10 miles wide. The least depth on the bank is 25 fathoms, but the depths are irregular. Northward and southward of the bank the depths are considerably greater.

For 9 miles from Heceta Head to Cape Perpetua, the coast consists of high broken rocky cliffs, except for the first 2 miles which are composed of much lower sloping sandy cliffs, backed by a strip of clear land. The hills behind reach an elevation of over 800 feet in less than 0.5 mile from the beach, and are heavily wooded.

Tenmile Creek, 5 miles northward of Heceta Head, is marked by a sand beach about 0.3 mile long at its mouth.

Cape Perpetua, 9 miles northward of Heceta Head, consists of two projecting points, the northerly of which is the bolder. It reaches a height of 800 feet a short distance from the beach and 1,000 feet at a distance of 0.8 mile. The rocky cliff forming the face of the northern point is reddish. A few rocks that uncover are close to its face.

Yachats River, navigable only for canoes, breaks through the coast hills immediately northward from Cape Perpetua.

The coast for 2.5 miles northward of Cape Perpetua consists of cliffs, 15 to 30 feet high, with a narrow strip of grassy land 0.2 to 1 mile wide behind them. Thence for 5.5 miles there are low bluffs, with a broad sand beach in front and comparatively low wooded country behind them, to Alsea Bay.

Table Mountain, 11 miles northeastward of the mouth of Alsea Bay, is flat-topped, covered with dead trees, and looks whitish. Another summit is 0.6 mile southwestward of Table Mountain.

Marys Peak, a prominent mountain 24 miles eastward of the entrance to Yaquina Bay, is wooded on its sides but its summit is covered with grass.

Chart 6056.—Alsea Bay is 68 miles northward of Cape Arago. The northern point is low, broad, and sandy, but the southern point is an abrupt sandstone cliff about 100 feet high, covered with trees. The entrance has a shifting bar with a depth of about 6 feet. With a rising tide, the bar fills in with sand and the full effect of the tide cannot be counted on. There is considerable fishing and crabbing in the bay and river, but boats rarely cross the bar. **Waldport,** a mile inside the entrance, is the principal settlement. A small-boat landing, where gasoline, other light fuels, and limited supplies are available, is at the northern tip of the village. The river is navigable for small craft to about 10 miles above the mouth.

The fixed bridge of the Oregon Coast Highway crossing Alsea Bay, a mile inside the entrance, has a clearance of 63 feet.

The 11.5-mile coast between Alsea Bay and Yaquina Bay is nearly straight, and consists of a low sand beach backed by dunes at each end with bluffs up to 100 feet high between; the land behind is low and wooded with areas of burned timber. Rocks covered 2 to 4 fathoms extend almost 2 miles offshore. **Seal Rocks,** abreast the highest part of the bluffs about 5 miles north of Alsea Bay entrance, extend up to 0.5 mile offshore for 2 miles; the tallest is 20 feet high.

Stonewall Bank, 17 miles southwestward of Yaquina Head Light and 14 miles offshore, is 9 miles long in a northerly direction and 2.5 miles wide. There is a least depth of 13 fathoms on the bank.

Yaquina Head, 32.5 miles northward of Heceta Head, is distinguished by two conical hills covered with grass. The outer one is 355 feet high and the inner 390 feet high, with a low saddle between them. The extremity of the point, which projects about a mile from the general trend of the coast, is broken and rocky, but comparatively low. One mile inland from the point, the grass-covered land changes to a dense forest and the hills rise rapidly. Two covered ledges lie northward of the point not over 0.5 mile from the beach. There is a covered rock and considerable kelp about a mile southward of the point. Southward to Yaquina Bay, the coast consists of broken yellow cliffs, bordered on the southern part by broad sand beaches.

Yaquina Head Light (44°40.6′ N., 124°04.7′ W.), 162 feet above the water, is shown from a 93-foot white conical tower on the flat bench projecting at the western extremity of the head; a radiobeacon is at the station. See Appendix for **storm warning display.** A patch of rocks that uncovers is about 1 mile northward from the light.

Yaquina Reef, a ridge of hard sand and rock, covered 5 to 13 feet, 0.7 mile off the entrance, extends parallel with the shore for 1.5 miles. The wreck of the concrete ship JOHN ASPIN uncovers 5½ feet on the reef about 0.5 mile north-northwestward from the outer end of the north jetty. **South Reef,** covered 11 feet, is a southerly continuation of Yaquina Reef, the two being separated by the entrance channel.

Chart 6055.—Yaquina Bay entrance is 4 miles southward of Yaquina Head Light. The bay is a tidal estuary, the harbor itself being merely the widening of **Yaquina River** just inside the entrance.

The northern point of Yaquina Bay entrance is a sandy bluff, 120 feet high. An abandoned lighthouse and a Coast Guard lookout tower are on the high part of the point. When viewed from the northwest, the circular lighthouse tower on the roof of a two-story frame dwelling obscures the lower portion of the lookout tower. The southern entrance point is a low sand beach backed by dunes rising to 150 feet.

The entrance to Yaquina Bay is protected by jetties 330 yards apart at the outer end. A lighted whistle buoy is 1.9 miles southwestward of the entrance. The channels are marked with a lighted range, lights, and buoys.

During the summer, when the swell is approximately parallel with the coast, the bar is comparatively smooth, being partially sheltered by Yaquina Head. In winter, however, the heavy westerly swell makes the bar very rough. A smooth bar and a favorable tide are necessary for large vessels leaving Yaquina Bay. In April 1962, the controlling depths were 19 to 16 feet from the entrance to the turning basin at McLean Point.

Strangers desiring to enter Yaquina Bay and River should employ a pilot or a man with local knowledge. At the entrance the buoys cannot be relied upon to indicate the best water, and in the river the depths are subject to frequent change.

Vessels anchor in the channel according to draft. A fixed highway bridge across the channel, 0.9 mile above the entrance, has a clearance of 124 feet. A Coast Guard station is on the north side of the bay, 400 yards northeastward of the bridge.

Newport, just inside the northern entrance point, is the principal town on the bay and river. It is principally a summer resort, although the town has considerable fishing and several small fish-processing plants. Lumber, either barged down from upper river mills or delivered by truck, is shipped from the wharves at Newport. The principal wharf for loading lumber is at **McLean Point,** 2 miles above the entrance. A depth of 21 feet can be taken from the turning basin to the lumber terminal.

A controlling depth of about 10 feet is available to a small-boat mooring basin at Newport behind the long breakwater.

Currents.—The current velocity is about 2 knots in Yaquina Bay entrance. Near Newport docks the velocity is about 0.5 knot. Off Yaquina, and 1 mile south of Toledo, the velocities are about 1 to 1.5 knots. For predictions see the Tidal Current Tables.

See Appendix for **storm warning displays.**

Pilotage and towage.—Licensed pilots are available and can be obtained by prior arrangement by radio. Privately owned tugs are berthed in Newport.

Quarantine.—Quarantine regulations are enforced. A U.S. Public Health Service outpatient office is in Newport.

Customs.—Newport is a port of entry.

Supplies.—Gasoline, diesel oil, water, some marine hardware, and groceries can be obtained.

Repairs.—Boats up to 60 feet in length and 7 feet in draft can be hauled out on the marine ways at Yaquina.

Communication is by bus and air. The municipal airport is about 4 miles south of Newport. A good highway extends north and south along the coast and another highway leads to the interior.

Federal project depth in Yaquina River is 10 feet to Toledo; this depth is generally maintained.

Yaquina is a small settlement 3.5 miles above the entrance. A power cable across Yaquina River, 0.5 mile above Yaquina, has a clearance of 77 feet. **Toledo,** 11 miles above the entrance, has large lumber mills. The depths alongside the wharves are 5 to 6 feet. The fixed highway bridge, 0.5 mile above Toledo, has a clearance of 34 feet. A pipeline with a clearance of 62 feet crosses the mouth of **Depot Slough** at Toledo.

Chart 5902.—From Yaquina Head to the mouth of Columbia River, the coast is fairly straight. The headlands are Cape Foulweather, Cascade Head, Cape Lookout, Cape Meares, Cape Falcon, and Tillamook Head. The 30-fathom curve follows the general trend of the coast about 3.5 miles offshore, without indicating the several headlands. When about opposite Tillamook Head, the curve swings west and is about 7.5 miles off the end of Clatsop Spit.

Chart 6056.—From Yaquina Head for 5.5 miles to Cape Foulweather, the coast consists of yellow and white sand stone cliffs, low and broken.

Iron Mountain, 1.5 miles northeastward of Yaquina Head Light, is a 654-foot high hill. The highest third of the hill is bare and composed of a red rock formation; the lower part is thickly wooded.

A low flat rock, 2 feet high, is 0.4 mile offshore 2.8 miles northward of Yaquina Head.

Otter Rock, 11 feet high, is 3.2 miles northward of Yaquina Head and 0.6 mile offshore. **Gull Rock,** 56 feet high, is 1.2 miles north of Otter Rock and 0.4 mile offshore. In line between the two rocks is a kelp field with several rocks, covered or awash. Covered rocks that break are 0.5 to 1 mile northward of Gull Rock.

Cape Foulweather is a prominent headland with about 6 miles of seaward face consisting of rocky cliffs over 60 feet high. The cape is formed by several grass-covered headlands, separated by densely wooded gulches. Near the middle of the cape is a strip of flat land, 0.5 mile long and 0.2 mile wide, bare of trees. The highest point of the cape is near the southern part. A grassy patch is conspicuous on the southwestern slope. About 0.9 mile southeastward of the extreme western point of the cape is a rocky point 445 feet high, and eastward of the point the hills rise to 1,100 feet in 0.6 mile. Dangers extend for nearly 2 miles northward of the northern point of Cape Foulweather and about 600 yards offshore.

The coast highway follows the shoreline closely at Cape Foulweather.

Depoe Bay, 8 miles north of Yaquina Head, has one of the best small-boat shelters along this part of the coast. The bay proper has foul ground on both north and south sides but the channel to the improved inner basin, though narrow, is deep and well marked. The foul areas break in moderate seas and are marked by kelp. Prominent from seaward are the concrete arch bridge over the entrance to the basin and the standpipe on the shoulder of a 500-foot hill 0.2 mile to the northward. A lighted whistle buoy is 1.1 miles westward of the entrance to the bay, and a bell buoy is farther inshore.

The Federal project depth of 8 feet through the 30-foot wide entrance channel to the basin is maintained.

The fixed concrete arched bridge over the entrance is unique in that its width of 30 feet is less than the clearance of 42 feet. The lighted range at the south end of the bridge marks the entrance to the bay on bearing **086°40′**; a fog signal is about 50 yards southwest of the front light. Floodlights about 50 yards seaward of the bridge illuminate the entrance to the inner basin; the power cable has a clearance of 50 feet. The navigator is cautioned against the dangerous surge in the narrow entrance.

A Coast Guard vessel is stationed in the inner basin; no lookout is maintained, but a siren and telephone are available at the north end of the bridge to summon aid. See Appendix for **storm warning display.**

The town of **Depoe Bay** is on the north side of the basin. The basin has a concrete bulkhead, mooring floats, and a grid that can accommodate any vessel able to enter. Hull and minor repairs can be made; fuel, water, hardware, and other supplies are available in small quantities.

Chart 5902.—From Cape Foulweather for 9.5 miles to the entrance of Siletz Bay, the coast continues as yellow broken bluffs, 40 to 100 feet high, bordered by about 3 miles of sandy beaches. From the northern point of the bluffs to the bay entrance there are sand dunes covered with low brush.

The entrance to **Siletz Bay** is 15 miles northward of Yaquina Head. The entrance channel is subject to frequent change, and drafts of 4 or 5 feet are considered the deepest that can be safely taken in at high water.

The northern point at the entrance is a low bluff with a narrow sand beach. The southern point is a low sandspit about 250 yards wide. The dunes on the spit are thinly wooded near the shore but become thickly wooded inland. The bay inside the entrance is shoal. Siletz River enters the bay at the southeast end.

Taft, the principal village in the bay, is on the coast highway. Gasoline and other light fuel oils are available by truck delivery. Several stores handle general merchandise. Immediately southward of Taft, a white covered bridge is prominent from seaward.

From the northern point of Siletz Bay the coast extends 7 miles northward to the Salmon River. For 2.5 miles of this stretch to the outlet of **Devils Lake,** the yellow sandstone cliffs are 80 to 100 feet high. The lake is a large body of fresh water, 10 feet above sea level, that empties through a narrow stream. At 0.5 mile west by south of the mouth of the stream is a covered rock that generally breaks. For 3 miles northward from the outlet of the lake, the bluffs are 20 to 60 feet high, rising to grassy hills. A broad beach and ledges of rocks are along the shore.

Salmon River empties at the southern extremity of Cascade Head; the entrance is nearly closed by sand bars.

Immediately southward of Salmon River is a rocky cliff whose seaward face is 0.6 mile long. The summit is a dome-shaped butte 510 feet high. From here a rolling grassy plateau with a few trees extends southward and eastward to the river. A rock, 46 feet high, is 700 yards westward of this cliff, and about a mile southward is a covered rock 630 yards off the beach. Immediately southward of and in line with Cascade Head, opposite the mouth of the river, are three grayish rocks about 765 yards offshore. These have heights of 56 feet on the north, 25 feet in the center, and 47 feet on the south.

Cascade Head, 23 miles northward of Yaquina Head, is very jagged and heavily wooded. The face of the cliff is 3 miles long, in places is over 700 feet high, and is cut by several deep gorges through which the waters of three creeks are discharged in cascades 60 to 80 feet high. Several rocks are about 0.1 mile offshore.

Two Arches, 30 feet high, is a rock 0.9 mile northward of the southern point of Cascade Head. The arches are visible from northward, the inner being the larger.

From Cascade Head for 9.5 miles to Cape Kiwanda, the coast is a low sand beach with a narrow marsh behind the southern part. Rolling hilltops, occasionally wooded, rise to an elevation of 500 feet behind the beach.

Neskowin Rock, at the high-water line about 0.3 mile northward of the northern extremity of the cliffs marking Cascade Head, rises abruptly from the sand beach to 113 feet in height. The rock is dark brown and wooded on top.

North of Neskowin Rock the Oregon Coast Highway is about 0.5 mile inland. At night the headlights of automobiles traveling this road cause intermittent flashes as they make the turns and might be mistaken for lights of vessels.

Nestucca River empties into **Nestucca Bay** 5.5 miles northward of Cascade Head. The channel over the bar changes frequently in position and depth, and only light-draft vessels having local knowledge are able to cross. A fixed highway bridge at Pacific City has a clearance of 9 feet. The river has many snags which change the depths and shift the channel. A buoy is 0.7 mile westward of the entrance. Even in a moderate sea, the bar is extremely dangerous. The point on the south side of the entrance consists of several low-rolling, grassy hillocks, about 400 to 500 feet high, which approach very close to the beach. The northern point is the southern extremity of the sandspit and dunes that extend to Cape Kiwanda.

Pacific City, a summer resort 3 miles above the entrance to Nestucca Bay, has a general store. Small quantities of oil and gasoline can be had.

Haystack Rock, 327 feet high, 0.5 mile southwestward of Cape Kiwanda and 0.5 mile offshore, is a prominent landmark. The rock is conical and dark for about half its height, and in summer the top is whitened by bird droppings.

Cape Kiwanda, 33 miles north of Yaquina Head, is a low yellow rocky point, much broken and eroded, that projects about 0.5 mile from the general trend of the coast. Behind the cape are bright sand dunes, 500 feet high, which are prominent from seaward.

From Cape Kiwanda the coast extends 7.5 miles in a general northerly direction to Cape Lookout. It is broken about halfway by the entrance to **Sand Lake,** which is shallow and not navigable. The coast consists of sand beaches and dunes until about a mile northward of Sand Lake where it changes to vertical sandstone cliffs, 50 to

100 feet high. These continue to Cape Lookout. The hills and country back of the beach as far as the ridge of Cape Lookout have been burned over except in the gulches, and numerous trunks of whitened trees are still standing.

Cape Lookout, 40 miles northward of Yaquina Head, projects westward for 1.5 miles, forming a narrow rocky promontory 432 feet in height at its seaward extremity. The southern face is nearly straight, and its precipitous cliffs have numerous caves. The northern face is sloping and covered with a thick growth of timber. The ridge that forms the cape runs at about right angles to the coast, reaching an elevation of some 2,000 feet, 3.8 miles inland. The northern face of the cape is smooth and bold for the first mile, and then is much broken and marked by caves and several cascades. Fair shelter in northwesterly winds may be had under the southern side of the cape in 6 to 8 fathoms, sandy bottom. A lighted whistle buoy is about 0.5 mile off the cape.

Northward of Cape Lookout for 4.5 miles, the land falls to a low narrow sandy peninsula, separating Netarts Bay from the ocean. The sand dunes on the peninsula are visible for 10 or 12 miles.

Netarts Bay is a shallow lagoon most of which is bare at low water. The village of **Netarts** is on the north shore a mile inside the entrance. Only light-draft vessels with local knowledge can enter; midchannel buoys mark the best water. A small-boat basin and launching ramp are at Netarts. Small quantities of gasoline, oil, and groceries can be obtained. Bus service is available.

Northward of the entrance to Netarts Bay, for 1.5 miles to the rocks forming the southern part of Cape Meares, the coast is a sandy beach, backed by cliffs 50 to 120 feet high. These cliffs, topped by sand dunes varying in height from 150 to 200 feet, are good landmarks.

Chart 6112.—Cape Meares, 48 miles north of Yaquina Head, is high and rocky, with a 2-mile long seaward face. The northern part is the higher, with nearly vertical cliffs 460 feet high. The western point is narrow, covered with fern and brush, and terminates seaward in a cliff 200 feet high.

Three Arch Rocks are the largest of a cluster extending 350 yards off the southern point of the cape. They range in height from 204 to 275 feet. The largest arch is in the middle of the lowest rock, and is about half the height of the rock above water. These rocks are the favorite resort of sea lions, whose barking can be heard a considerable distance with a favorable wind.

Cape Meares Light (45°29.2′ N., 123°58.6′ W.), 232 feet above the water, is shown from a white masonry building on the summit of the cliff.

Pillar Rock, 102 feet high, is 0.2 mile northwestward of Cape Meares, and 0.4 mile farther northwestward is **Pyramid Rock,** 109 feet high, which leans seaward.

From Cape Meares to Kincheloe Point, the coast is a low partly wooded sandspit, with dunes 40 to 50 feet high. It forms the western shore of Tillamook Bay. A sand dike prevents a break-through north of Cape Meares, at **Pitcher Point.**

Tillamook Bay entrance is 42 miles southward of the Columbia River, 22.5 miles southward of Tillamook Rock Light, and 5 miles northward of Cape Meares Light. The bay has a tidal area of about 13 square miles, most of which, at low tide, presents a succession of sand and mud flats.

Shipments from the bay are farm and dairy products, lumber, and fish. General merchandise is received by rail and truck. Local products usually are shipped by rail or truck, but logs are towed on barges to Columbia River.

Kincheloe Point is low and sandy. The north side of the entrance is the termination of a high wooded ridge extending between the bay and Nehalem River. **Green Hill,** opposite Kincheloe Point, is a 421-foot spur that terminates in a bluff rounded point. The prominent hill is covered by ferns, grass, and dense brush with trees on top.

A Coast Guard station is on the northern shore west of Garibaldi. The lookout tower is on the jetty about 200 yards from its inner end at the foot of a knoll.

The north side of the entrance to Tillamook Bay is protected by an 800-yard jetty, but the outer 300 yards has been beaten down by the sea. A lighted whistle buoy is nearly 0.8 mile westward of the end of the jetty. The channel to Garibaldi is marked by a lighted range, lights, and buoys. The bar sometimes makes out across the range from the northward during the summer or whenever there have been any long periods of northwesterly winds.

In July 1962, the controlling depth was 17 feet in the entrance channel, thence 15 feet to Garibaldi. The channel to the small-boat basin at Garibaldi was dredged to 12 feet.

Several visible and covered rocks are on the northerly side of the dredged entrance channel. **Sow and Pigs,** across the channel from Kincheloe Point and nearly 500 yards off the northern shore, is a small rocky ledge that uncovers about 4 feet. The ledge is dangerous when entering with a flood current, as the current sets toward it.

The current velocity is 3 knots in the entrance to Tillamook Bay. Daily predictions are given in the Tidal Current Tables.

See Appendix for **storm warning display.**

Garibaldi, a lumber and fishing town, is on the northern shore 0.5 mile inside the entrance. A black concrete stack and a silver elevated tank are conspicuous. There are two small canneries and a wharf at Garibaldi. Lumber mills in **Miami Cove,** on the east side of Garibaldi, ship by rail.

A boat basin for commercial and sport fishing is just west of the plywood mill at Garibaldi. Gasoline, diesel oil, water, groceries, and a limited amount of marine hardware can be obtained.

A pilot, or a fisherman having local knowledge, can be obtained. Two commercial towboats take logs out of the bay.

South of Garibaldi, **Bay City Channel** is marked by lights and follows the eastern side of Tillamook Bay to

the southern end where it continues through narrow and crooked **Hoquarten Slough** to Tillamook, 11 miles above Tillamook Bay entrance. The channel has a depth of about 6 feet to Bay City, 4.4 miles above Tillamook Bay entrance, but south of this point depths are less than 3 feet to Tillamook. During freshets, snags are carried into the upper part of the bay where they form a menace to navigation.

Bay City has a small cannery on a wharf which bares at low water. Fishing and crabbing are carried on in the vicinity, but all shipments are made by truck or rail.

Tillamook is noted for the production of cheese. It is the distributing center for a rich farming and dairying section. Some logs are towed to Garibaldi or Miami Cove to make rafts for towing to Aberdeen. Gasoline, diesel oil, water, groceries, and some marine hardware can be obtained. Repair facilities are limited to carpentry work and minor repairs to launch engines.

Chart 5902.—From Tillamook Bay to Nehalem River, the coast is nearly straight for about 5 miles. Several lakes in this stretch are separated from the beach by wooded sand dunes. The heavily wooded hills begin to rise 0.5 mile to 0.8 mile from the beach and in 1 mile reach elevations of 1,000 to 1,600 feet.

Twin Rocks are 700 yards offshore and 2 miles northward of the entrance to Tillamook Bay. Their bases are so close together that they usually look like one rock. The southerly and larger has an arch in it.

Chart 6122.—Nehalem River, 5 miles northward of Tillamook Bay entrance, is tidal for about 10 miles from the entrance. Above this point the river is a mountain stream full of riffles and obstructed by boulders. The river constitutes a natural outlet for an extensive area of heavily timbered country. Lumbering and fishing are the principal industries. Sawmills are located along the lower river.

Nehalem Beach, the northern point at the entrance, is a narrow sandspit, bare of trees, and with dunes of moderate elevation over the northern part. The southern side of the entrance is a low broad sand beach, backed by wooded country rising to elevations of 400 feet.

The entrance is protected by jetties extending 600 yards from the shoreline. A whistle buoy is nearly a mile west of the entrance. The channel is marked by an entrance range and daybeacons.

The depths on the bar and within the bay are not sufficient for coastwise shipping; all lumber is shipped out by rail. The controlling depth is about 7 feet on the bar, and 7 to 8 feet to Wheeler. The channel is changeable.

Gasoline can be obtained in season at the small-boat facility at **Jetty,** on the east side of the river just inside the entrance.

Brighton is a small settlement on the eastern shore, a mile inside the entrance to the river. **Wheeler,** 4.7 miles above the entrance has an abandoned sawmill and wharf in ruins. All traffic is by rail and truck.

Nehalem is a small settlement on the western shore of the river, 6.3 miles above the entrance. A highway bridge over the river just below Nehalem has a swing span with a clearance of 21 feet; close south of this bridge is a power cable with a clearance of 48 feet.

Chart 5902.—The coast is low and sandy for about 3 miles northward of Nehalem River entrance, then a dense forest begins which rises gradually to the southern slope of Neahkahnie Mountain. There are grassy hillocks, 40 to 100 feet high, in the vicinity of the beach.

Cape Falcon, 17 miles northward of Cape Meares and 10 miles southward of Tillamook Rock, projects about 2 miles from the general trend of the coast. The seaward face, less than 0.5 mile in extent, is very jagged with numerous rocks under the cliffs. The southwestern point of the cape is composed of nearly vertical cliffs, 200 feet high, and is partially timbered. **Falcon Rock,** 0.7 mile westward of the cape, is small and not very conspicuous.

Smuggler Cove, a small bight just southward of Cape Falcon, is an excellent anchorage for small boats. The best anchorage is close to the northern shore in 4 to 5 fathoms, protected from all except southwesterly winds. Care should be taken to avoid two rocks; bare at extreme low water, that are about 150 yards from the north shore of the cove and rise abruptly from deep water.

Neahkahnie Mountain, 2.8 miles inland of Cape Falcon, is a prominent landmark, and the most important feature for locating Nehalem River. The western summit of the double-headed mountain is rounded and 1,900 feet high, but the eastern summit is serrated and divided into three peaks of nearly equal height. The entire southeastern slope is bare of timber but is covered with grass and fern. The seaward face terminates in rocky broken cliffs over 500 feet high, and there are a few rocks about 100 feet from the beach. The two summits are visible from southward; from northward, the western summit hides the eastern and is very conspicuous.

Northeastward of Cape Falcon, and 2 to 3 miles back from the shoreline, is a group of peaks; the highest and most prominent has a rounded summit, with a very gentle slope to the southward and a more marked and abrupt drop to the northward. It is very conspicuous from westward in clear weather.

Arch Cape, rocky and precipitous, projects slightly from the general trend of the coast. It is the termination of a mountain ridge rising to 2,775 feet about 3 miles eastward. The cape is bare of timber on the southern slope for a short distance from the point. A high rock is close to the cape and connected with it at low water. A smaller rock is about 100 yards seaward of the larger. There are several other high rocks in the vicinity of the cape.

Castle Rock derives its name from its remarkable resemblance to a medieval castle with two towers, the taller of which is on the seaward end. It is about 0.8 mile westward of the highest part of Arch Cape, and is the outermost bare rock. The upper part of the rock is covered with bird droppings and shows up very distinctly in sunlight. A rock awash is about 0.9 mile off the cape and 0.4 mile southwest of Castle Rock; another rock, bare at lowest tides, is 0.5 mile offshore and 1 mile south of Castle Rock.

Hug Point is a small cliff close to the beach, 1.8 miles northward of Arch Cape; the cliffs in its vicinity are about 180 feet high.

Double Peak, halfway between Cape Falcon and Tillamook Head, is the seaward end of a ridge extending eastward, which reaches a height of 1,050 feet in less than 0.7 mile from the shore. It is heavily wooded and pitches abruptly to the sea, ending in a rocky broken cliff 100 feet high and 0.2 mile long. A rock is close to and abreast of the southern end of the cliff; another rock is close to and abreast the northern end. A ledge, with two rocks that uncover about 4 feet, is about a mile west-southwestward of the highest part of the cliff.

From Double Peak, the coast extends northward for 2.7 miles to the mouth of **Elk Creek**, and then turns sharply northwestward for the same distance to the western point of Tillamook Head. The coast is high and wooded with broken cliffs bordered by numerous rocks, except at **Cannon Beach** at the mouth of Elk Creek.

Haystack Rock, 1.5 miles northward of Double Peak, is the largest of a cluster of rocks stretching out from the low water line to 10 fathoms. A rock awash at low water and surrounded by about 9 fathoms is 0.8 mile southwestward of Haystack Rock.

Tillamook Head, 76 miles north of Yaquina Head, ends in two points which are 0.5 mile apart. The cliffs are 560 feet high at the southern point and 1,000 feet high at the northern point. A pinnacle rock is at the foot of the northern cliffs, and extending offshore from it for 300 yards is a cluster of rocks, 45 to 150 feet high, the outer one being the lowest. The summit of the head is flat and densely wooded, with slightly lower land behind it.

Tillamook Rock, nearly 1.2 miles west of the southern point of Tillamook Head, has an abandoned lighthouse and buildings on it. The western face leans a little seaward. A rock awash is between Tillamook Rock and the nearest part of Tillamook Head. A lighted whistle buoy is 0.5 mile westward of the outer rock.

North of Tillamook Head the coast is a broad sand beach extending for 17 miles to Clatsop Spit, on the south side of the entrance to Columbia River. Low sandy ridges, covered with grass, fern, and brush, extend parallel with and back of the beach. **Necanicum River,** a small stream, empties at the summer resort of **Seaside,** 2.5 miles from the north side of Tillamook Head.

Saddle Mountain, double-headed and 3,283 feet high, is the landfall for the approach to the Columbia River. The mountain is 14 miles east of Tillamook Rock and is visible 50 miles offshore. From northwestward, the mountain appears to be triple-headed; the northeastern peak appears cone-shaped, sharp, and lowest; the middle peak is irregularly cone-shaped; and the southern and highest peak is a flat-topped cone.

10. COLUMBIA RIVER, OREGON AND WASHINGTON

Chart 5022.—Columbia River rises in British Columbia, Canada, through which it flows for some 370 miles before entering the continental United States in northeastern Washington. Thence it flows southerly to its junction with Snake River, from which it curves westerly and forms the boundary between the states of Washington and Oregon for the remainder of its course to the Pacific Ocean. Its entrance is 548 miles north of San Francisco and 145 miles south of the Strait of Juan de Fuca. The length of the river is 647 miles in the United States. Between the Cascade Mountains, the river flows through a canyon averaging about 5 miles in width between high cliffs on each side; of this width, the river occupies about 1 mile, the rest being marsh, low islands, and lowlands. Near the mouth, the river becomes wider, and in some places is 5 miles across.

Columbia and Willamette Rivers are navigable by deep-draft vessels to Portland, Oreg., and Vancouver, Wash.; the Columbia above Vancouver is maintained at a depth of 27 feet to The Dalles Dam, 164 miles above the mouth. From there to Priest Rapids Dam on the Columbia River there are lesser depths, and the tributary Snake River is limited to high-water navigation as far as Lewiston, Idaho.

However, upon completion of the John Day Dam and lock on the Columbia, and the remaining three projected dams and locks on Snake River, slack-water navigation will be available to Lewiston.

The hydroelectric power plants at the dams on the Columbia provide the major supply of electricity for the entire Northwest.

The commerce, both foreign and domestic, is extensive. The exports are principally lumber, grain, flour, fruit, fish, and general merchandise; the imports are coal, fuel oil, cement, manufactures, and general merchandise. There are numerous settlements and landings, but Astoria, on the south bank 12 miles inside the entrance, and Portland, on the Willamette River 9 miles from its junction with the Columbia, are the principal shipping points.

Distances shown in the text as Mile 0.9, Mile 12, etc., are *the nautical miles above the mouth of Columbia River.* Mile 0.0 is at the junction of the Main Channel Range and a line joining the outer ends of the jetties. The distance to the mouth of the river from a position 0.5 mile west of the Columbia River Lightship is 5.6 miles.

Prominent features. — Columbia River Lightship (46°11.1′ N., 124°11.0′ W.), with red hull and the name COLUMBIA in large white letters on the sides, is 5.3 miles off the entrance and on the entrance range line; the light is 57 feet above the water. A radiobeacon and fog signal are at the lightship. The code flag signal and radio call is NNCR. **Storm warning displays** are made during the daytime.

Mount Saint Helens, nearly 10,000 feet high, cone-shaped and snow-capped, is about 75 miles eastward of the entrance to the river. On a clear day it is visible when looking up the valley from seaward. **Mount Hood** and **Mount Adams** are also lofty snow-covered peaks, visible from parts of Columbia River on a clear day.

Clatsop Spit, on the southern side of the entrance, is a low sand beach, extending about 2.5 miles northwestward from Point Adams. There is a tendency for the shoal northward of the spit to build up to the northwestward due to spring freshets and northwest storms; vessels are cautioned to keep informed as to conditions here.

Point Adams, just inside Clatsop Spit, is a low sandy point covered with fir and undergrowth to the edge of the sand beach and low dunes. The point usually shows well from seaward, particularly if it is hazy inside. A Coast Guard station is on the eastern side of the point at Hammond. The red storm warning lights at the station are obscured from 015° to 180° to prevent possible confusion with aids to navigation by inbound vessels.

Cape Disappointment, the rugged northern point at the Columbia River entrance, is the first major headland along the 20 miles of sand beach north from Tillamook Head. It comprises a group of rounding hills covering an area 2.5 miles long and 1 mile wide, divided by a narrow valley extending north-northwestward. The seaward faces of these hills are precipitous cliffs with jagged, rocky points and small strips of sand beach. **Cape Disappointment Light (46°16.6′ N., 124°03.1′ W.)**, 220 feet above the water, is shown from a 53-foot white conical tower on the extreme southeastern point of the cape; a radiobeacon is at the station. A Coast Guard station is at Fort Canby on the eastern side of the cape.

From the southward, Cape Disappointment shows as three low knobs, separated by low flat ridges. North Head Light shows on the western slope of the western knob. From the westward, the cape is not prominent, but in fog, haze, or smoke inside the cape, it stands out clearly. From northwestward, the cape appears as a flat island with a slight depression in the center and a timbered knob at each end. From this direction, a low, flat hill with gently sloping sides between the cape and high ridges eastward appears as an island from a distance.

McKenzie Head, 0.8 mile northwestward of Cape Disappointment Light, is 190 feet high and nearly round. It is covered with grass and fern but is bare of trees.

North Head, the extreme western point of the cape, is 270 feet high, with a very jagged, precipitous cliff, backed by a narrow grassy strip; the higher ground behind it is covered with trees. **North Head Light (46°18.0′ N.,**

124°04.6′ W.), 194 feet above the water, is shown from a 65-foot white conical tower on the western point.

The entrance to Columbia River is marked by two jetties. The south jetty extends 2.7 miles seaward from the northwest end of Clatsop Spit. The north jetty extends 800 yards seaward from the shoreline on the north side of the entrance. Lighted ranges, lights, buoys, and daybeacons mark the channels.

Boundary lines of inland waters.—The line established for the Columbia River is described in **82.125**, Chapter 2.

Channels.—Federal project depths in Columbia River are 48 feet over the bar, thence 35 feet to the Broadway Bridge at Portland, Oreg., 30 feet from the confluence of Willamette and Columbia Rivers to Vancouver, Wash., and thence 27 feet to The Dalles. These depths are maintained. Controlling depths are published in the Notice to Mariners, and additional information can be obtained from the Corps of Engineers, Pittock Block, Portland, Oreg.

Depths.—Minimum depths are given at mean lower low water from the entrance to Harrington Point, thence at Columbia River Datum to Bonneville Dam on the Columbia River, and Willamette Falls Dam near Oregon City on the Willamette River. **Columbia River Datum** is the mean lower low water during lowest river stages. The staff gage at the Columbia River Pilots' Office, at the foot of 14th Street at Astoria, Oreg., is set with zero at mean lower low water. The staff gages located on the bars from Harrington Point to Portland, Oreg., are set with zero at Columbia River Datum.

Anchorages.—Limits and regulations of the anchorage areas in the Columbia River are given in **202.228**, Chapter 2.

Bridges and cables.—Clearances of bridges and cables over Columbia River and its tributaries are at mean lower low water below Harrington Point and at Columbia River Datum above that point. The clearances are referred to normal pool level above the dams on the Columbia River, and above the low water slope on the Willamette River above the locks at Oregon City.

Caution regarding aids to navigation.—During the seasonal high-water conditions, aids to navigation may be destroyed or rendered unreliable. Mariners are warned to exercise caution in navigating the river and to obtain the latest information regarding aids to navigation by local inquiry and through local Notice to Mariners, available upon request to the Commander, 13th Coast Guard District, Seattle, Wash. Every effort is made to restore the aids to operating condition as soon as possible.

Routes, Columbia River approach.—The lights at the entrance and at Willapa Bay 28 miles northward, are distinguishing marks for determining a vessel's position and subsequent shaping of her course.

In thick weather, great caution is essential on the approach from any direction. The currents are variable and uncertain. Velocities of 3 to 3.5 knots have been observed between Blunts Reefs and Swiftsure Bank, and velocities considerable in excess of those amounts have been reported. Under such conditions, vessels should keep outside the 30-fathom curve until the lightship has been made. Care should be taken not to mistake the low sand beach northward of Cape Disappointment for that southward of Point Adams. Nearly all the vessels which have gone ashore attempting the entrance have been wrecked northward of the mouth, in the vicinity of Peacock Spit.

In clear weather, vessels should have no difficulty in entering the river as the aids to navigation are numerous. In thick weather, however, when the aids cannot be seen, strangers should not attempt to enter without a pilot.

Local vessels entering in thick weather and with a rising tide, as a rule, do not attempt to pass beyond Desdemona Sands Light, because of the difficulty under such circumstances of avoiding vessels anchored in the narrow channel above the light.

Strangers should not attempt to run the river at night.

Dredges will usually be found at work in the channels; these dredges should be passed with caution and reduced speed. See **207.670**, Chapter 2, for regulations.

Weather.—An estimate of bar conditions, visibility, and weather, may be obtained by radio from the Coast Guard Cutter at Astoria, or the Point Adams Coast Guard station at Hammond.

Currents.—The currents at the Columbia River Lightship are described in the Tidal Current Tables.

Caution.—The Columbia River bar is reported to be very dangerous because of sudden and unpredictable changes in the currents often accompanied by breakers. It is reported that ebb currents on the northern side of the bar attain velocities of 6 to 8 knots, and that strong northwesterly winds sometimes cause currents that set northward or against the wind in the area outside the jetties.

In the entrance the currents are variable, and at times, reach a velocity of over 5 knots on the ebb; on the flood they seldom exceed a velocity of 4 knots. The current velocity is 3.5 knots, but this tidal current is always modified both as to velocity and time of slack water by the river discharge. On the flood there is a dangerous set toward Clatsop Spit, its direction being approximately east by south; on the ebb the current sets along the line of buoys. Heavy breakers have been reported as far inside the entrance as buoy 12, southward of Sand Island.

See the Tidal Current Tables for daily predictions.

Freshets.—The annual high-water freshet stage on the Columbia occurs in the latter part of May, but on Willamette River the peak-flow period usually begins in mid-December and continues through February, according to measurements taken by the U.S. Geological Survey over the past 70 years. Thus, the Willamette is low or nearly so at the time of the peak flow on the Columbia in late May. This causes the Willamette to apparently change direction under the influence of the stronger flow or "back-up" from the Columbia, which change is apparent at least as far up the Willamette as the city of Portland.

On Columbia River, the freshet flow causes some shoaling in the dredged cuts, but redredging is done to maintain project depths.

Since logging is one of the main industries of the region, free floating logs and submerged deadheads or sinkers

are a constant source of danger in the Columbia and Willamette Rivers. The danger is increased during spring freshets. **Deadheads** or **sinkers** are logs which have become adrift from rafts or booms. One end of the sinker settles to the bottom while the other floats just awash, rising and falling with the tide.

Ice forms occasionally in both the Willamette and Columbia Rivers, but it is seldom heavy enough to seriously affect navigation.

Pilotage.—Pilotage across the Columbia River bar and up or down the river is not compulsory, but pilots are always available. Vessels requiring a pilot should radio (Code Word) Bar Pilots Astoria, 12 hours prior to arrival, stating expected time of arrival at the Columbia River Lightship in order to be assured of a bar pilot being available.

The Bar Pilots maintain the converted minesweeper, PEACOCK, radio call WA-9403, and the 65-foot boat COLUMBIA, radio call WJ-8200; both operate on 2738 kc. They are equipped to receive and transmit on 2182 kc., and normally guard that frequency.

Pilots are transferred from the pilot boat by means of a pulling boat, and the ship should have a boat rope for the small boat to hang onto, this boat rope to be made fast on deck, about 75 feet on each side of the ladder, with the bight down to the water's edge.

The COLUMBIA normally operates from about May 15 to September 15, and comes directly alongside a ship. To assist the pilot in boarding from the bow, the ship is requested to have approximately 4 knots headway and have the bottom of the pilot ladder 8 feet from the water's edge with the wind and swell either on the ship's bow or quarter, and the ladder clear of the gangway or obstructions.

The bar pilotage ground extends from the uppermost dock or wharf at the port of Astoria to the open sea, at least 10 miles beyond the outermost buoy, and the river pilotage ground extends from the lowermost dock or wharf at the port of Astoria to the head of navigation on the Columbia or Willamette Rivers and their tributaries. The transfer of a bar pilot to a river pilot is made off Astoria. The radio code word for Columbia River Pilots is COLRIP. The whistle signal is one long and three short blasts.

An occulting amber light is maintained by the Columbia Bar Pilots, in cooperation with the Coast Guard, on the outer end of the pier on the west side of Tongue Point. When this light is exhibited it will inform outward bound vessels that desire a bar pilot that the bar is not passable and that the vessel should anchor.

Chart 6151.—Baker Bay is a shoal open bight, eastward of Cape Disappointment, formed by the cape and the recession of the land northward. **Sand Island,** low and flat, is in front of the bay. A Federal project provides for a channel 10 feet deep to the turning basin at Ilwaco. This channel lies westward of Sand Island. The controlling depth is about 6½ feet to Ilwaco. The former channel eastward of Sand Island is no longer maintained. The entrance is subject to continual change. As there is usually a swell here, the channel should be navigated only at high water with local knowledge. The remainder of the bay is covered with shoals and abandoned fish traps.

Ilwaco is the base for a large commercial and sport fishing fleet. Gasoline and diesel fuel are pumped at the basin; ice, water, and other supplies are available. The largest marine railway can haul out boats up to 75 tons for general repairs. The **Port of Ilwaco** administers the docks and facilities of the port.

Desdemona Sands, a shoal area extending from just inside the entrance of Columbia River for about 8 miles southeastward, divides the river into the main channel to the south and a secondary channel to the north. **Desdemona Sands Light (46°13.5′ N., 123°57.2′ W.),** 17 feet above the water, is shown from a white platform on piles on the western end of the shoal; a fog signal is at the light.

Fort Stevens wharf, at Mile 7.3 on the Oregon side, is marked by a light and fog signal on a dolphin off the end. A narrow catwalk connects the light structure with the wharf which is in ruins. The Fort Stevens Boat Haven is at **Hammond,** 0.2 mile southeastward of the wharf. Its entrance is marked by lights on the end of the jetties. Depths inside are about 6 feet.

Warrenton, on the **Skipanon River** at Mile 9.5, is the site of several sawmills, canneries, and fertilizer works. The largest marine ways here can haul out craft up to 110 feet in length; general hull and engine repairs are made. A sizable mooring basin is in the easterly part of the river some 1.4 miles above the entrance. Diesel oil, gasoline, lubricants, ice, and water are available. Depths through the entrance channel are about 15 feet, but only 5 feet in the channel above the railroad bridge.

Above the waterfront area the river is crossed by two drawbridges, the least clearance of which is 10 feet above mean lower low water, and the least width 33 feet. A power cable at the second bridge has a clearance of 68 feet. See **203.740,** Chapter 2, for drawspan regulations.

Scarboro Hill, 820 feet high, is on the Washington side about 7 miles eastward of Cape Disappointment. It is a long, gradually rising ridge, covered with grass, fern, and some trees. A number of conspicuous light-colored buildings of the historical Fort Columbia State Park may be seen near the base of the hill.

A Federal project channel 7 feet deep in 1962 leads from Columbia River just off the eastern end of Sand Island, to a basin at **Chinook,** on the Washington side. A pile-and-timber bulkhead wharf at the town is owned by a packing company, but a portion of the wharf is used as a public landing.

Smith Point, at Mile 11.3 on the Oregon side, is the western termination of a high, wooded ridge; it is the first prominent point on the southern bank southeastward of Point Adams. The ridge culminates in **Coxcomb Hill,** 595 feet high, behind Astoria. The Astor Column on the top of the hill is prominent.

Youngs Bay is a shoal body of water just westward of Smith Point. It receives the waters of **Youngs River** and

Lewis and Clark River. Traffic on the two rivers is confined chiefly to towboats handling log rafts just above the two highway bridges. Small tugs operate to the town of **Olney** on Youngs River at high tide. A powerhouse with a prominent white concrete stack is on the northern shore of the bay, just westward of the highway bridge.

The reported controlling depths are 7 feet to and inside Lewis and Clark River, and about 8 feet in Youngs River to the highway bridge, with deeper water inside.

The railroad swing bridge across Youngs Bay, near the mouth, has a clearance of 17 feet. The highway bascule bridge, 2.1 miles above the mouth, has a clearance of 24 feet. The first of several cables, 0.7 mile above this bridge, has a clearance of 103 feet.

Over Lewis and Clark River, 0.8 mile above the mouth, is a highway bascule bridge with a clearance of 25 feet. The power cable at the bridge and the one 1.8 miles above the mouth have a least clearance of 72 feet. The highway bridge, 4.8 miles above the mouth, has a fixed span 18 feet wide with clearance of 10 feet.

See **203.740,** Chapter 2, for drawspan regulations. Clearances are above **mean lower low water.**

Astoria, at Mile 12 on the Oregon side, extends from Youngs Bay to Tongue Point. It is the principal city on the lower portion of Columbia River. It has connections with the interior by both rail and river steamers; large quantities of grain, lumber, and general merchandise are shipped to both foreign and domestic ports. Oil products are received.

A mooring basin for trolling boats and others is maintained by the Port of Astoria just eastward of its piers at Smith Point. The basin can accommodate about 400 boats. Another small-craft mooring area, known as East End Basin, is at the eastern extremity of the waterfront. It can handle about 100 boats.

Anchorage.—The anchorage areas off Astoria are given in **202.228,** Chapter 2. Harbor regulations prohibit vessels from anchoring more than 1 hour within an area bounded on the south by the Astoria waterfront and on the north by the main channel buoys. Temporary anchorage may be had by vessels of suitable draft just east of buoy 19, northwest of Desdemona Sands Light.

Tides.—The mean range of tide at Astoria is 6.5 feet. The range between mean lower low water and mean higher high water is 8.2 feet. A range of about 12 feet may occur at the time of maximum tides. Daily tide predictions for Astoria (Tongue Point) are given in the Tide Tables.

Currents.—Above Astoria the current velocity is 1 to 3 knots except during the freshet period when the ebb is considerably increased although not enough to seriously affect navigation.

Towage.—Tugs are always available. Barges of several sizes are available at all times. The SALVAGE CHIEF, a 200-foot salvage tug, bases at Astoria.

Quarantine.—Quarantine regulations of the U.S. Public Health Service are enforced. The quarantine officer is stationed in Portland, and he may be requested at Astoria or other ports of call by previous arrangements. An outpatient office of the Public Health Service is at Astoria.

Customs.—Astoria is a port of entry; marine documents are issued.

Immigration.—There is no office here. Arrangements can be made through the Portland office if required.

Harbor regulations are prescribed by the Port of Astoria Commission. Copies of the complete harbor regulations may be obtained from the harbormaster.

Wharves.—The **Port of Astoria,** a municipal corporation embracing all of Clatsop County, owns a substantial part of the waterfront at Smith Point, and operates a well-equipped modern terminal of three piers. The offices are on Pier 1. Depths alongside range from 20 to 35 feet.

Supplies.—Fuel oils, provisions, and marine hardware are available.

Repairs.—Marine railways here can haul out craft up to 400 tons in weight. There are machine shops and foundries. Complete salvage equipment is available. The Tongue Point naval dock is available in emergencies.

Communication between Astoria and Portland and intermediate points is by railroad, truck, and bus. Astoria is on the Columbia River Highway which extends from Seaside, Oreg., to Astoria, thence along the southern bank of the Columbia.

A Coast Guard cutter is stationed at the port during the greater part of the year.

Point Ellice, on the Washington side 9.5 miles inside the entrance, is the termination of a spur from the mountain ridge back of Scarboro Hill. The point is rounding and rocky, but not high. Two high hillocks lie behind the point. In this area there are many abandoned fish traps and pile structures which extend out into the river.

Megler, a mile northeastward of Point Ellice, is the site of the Oregon State Highway Department ferry landing for the ferries operating to Astoria. In 1962, a fixed highway bridge was under construction between Astoria and Point Ellice; design clearance is 200 feet.

Tongue Point, at Mile 16 on the Oregon side, is a bold, rocky peninsula, 308 feet high, covered with trees and connected with the southern bank by a low, narrow neck; it projects into the river for 0.8 mile. A buoy depot of the Coast Guard is on the western side of the peninsula near its inner end. On the eastern side are the concrete piers of the former naval base. The area adjacent to the piers has a general depth of 20 feet.

Cathlamet Bay lies eastward of Tongue Point and southward of the Main Ship Channel. There are many islands which are covered with tule in the summer, but in the winter they are almost indiscernible. The **John Day Channel** extends between Tongue Point and **John Day Point.** At the junction with the **John Day River,** just northward of the point, the name changes to **South Channel,** which follows the shore closely to and around **Settler Point** to **Svensen.** These channels are buoyed. The Maritime berthing area is on the west shore of Cathlamet Bay southward of Tongue Point; regulations are given in **207.900,** Chapter 2. The power cables across John Day

River have a least clearance of 38 feet at mean lower low water; drawbridge regulations are given in **203.745**, Chapter 2.

The eastern part of Cathlamet Bay (Chart 6152) is used mostly for logging operations and log storage.

Grays Bay on the Washington side, extends from **Grays Point** to **Harrington Point** northward of the Main Ship Channel. In the northeastern section of the bay are extensive mud flats. **Deep River** flows into the northern part of the bay. The channel is marked and follows the shore from Grays Point around **Portugese Point** and **Rocky Point.** This river is used only by small pleasure craft and sport fishermen. Depths of 6 feet are available for about 2 miles above the mouth, above which it is shoal and probably good for no more than 2 feet.

Grays River, entered just eastward of Deep River, is another small stream used only by pleasure craft. Depths are not more than 2 feet, and much of the stream is blocked by snags and sunken logs.

Chart 6152.—Between **Harrington Point,** Mile 20.5, and **Crims Island,** Mile 47.5, Columbia River main channel follows the northern bank to **Three Tree Point,** thence swings around the bend, holding to the northeastern shore as far as **Hunting Island,** where it swings along the southerly shore until off the southeastern end of **Puget Island;** thence it follows the northerly bank from **Cape Horn** past **Abernathy Point** and northward of Crims Island and **Gull Island.**

Currents.—In this section the current velocity is about 1 knot. Because of the river flow, which combines with the current, the upstream flow is weak or nonexistent and the downstream flow attains velocities of 2 to 3 knots.

Local magnetic disturbance.—Differences of as much as 3° from the normal variation have been observed along this section of the river.

Steamboat Slough, northeastward of **Price Island** at Mile 29.3 on the Washington side, is used by fishing boats, tugs, and for log storage. The controlling depth through the slough is about 9 feet.

Elochoman Slough, on the eastern side of Hunting Island at Mile 31.4, is used for log storage and by tugboats. Depths through the slough are 1 to 5 feet.

At Mile 35, a power cable with a clearance of 221 feet crosses the main channel to Puget Island.

Cathlamet Channel joins the main channel at Mile 32.3 on the Washington side. It is used by fishing boats, tugs, log rafts, and barges; and for some log storage above the city of **Cathlamet;** 10 feet can be carried. A fixed highway bridge crosses the channel from Cathlamet to Puget Island; the clearance is 74 feet for the northerly span. A power cable, 0.5 mile above the bridge, has a clearance of 99 feet.

Westport Slough, at Mile 37.8 on the Oregon side, leads to the dock of an abandoned lumber mill at the village of **Westport.** In January 1963, the controlling depth in the channel to the dock was 23 feet. Above Westport, the slough is used for log storage; about 7 feet can be carried to **Kerry,** 2.4 miles above the mouth. A power cable, 1 mile above the mouth, has a clearance of 76 feet. A ferry operates between Westport and **Pancake Point** on Puget Island.

Wallace Slough, at Mile 41 southward of **Wallace Island,** is used by cannery tenders, fishing boats, and house floats. A depth of 4 or 5 feet can be carried through the slough. **Beaver Slough** enters Wallace Slough at the mouth of the canal and is used by fishing boats and float houses. **Clatskanie River** is a tributary of Beaver Slough. A railroad bridge, about 0.6 mile above the mouth, has a clearance of 16 feet; drawspan regulations are given in **203.740,** Chapter 2. At Clatskanie is a wharf and warehouse.

Bradbury Slough, at Mile 47.1 southwestward of Crims Island, has depths of 9 feet as far as the upper end where it shoals to 3 feet. There is extensive log storage along the Crims Island shore.

Chart 6153.—Between Crims Island and Saint Helens, Mile 75, the main channel starts its southeastward swing, passing southerly of **Fisher Island** and northerly of **Walker** and **Lord Islands;** thence, under the Longview fixed bridge, thence westward of **Cottonwood Island,** east of **Sandy Island,** and westward of **Martin** and **Burke Islands.** Numerous jetties along this stretch are usually marked by lights or daybeacons.

Currents.—In this section the current velocity is 0.5 knot. During 6 days of observations taken in June and July there was a continuous downstream flow varying from 0.5 to 2 knots.

Local magnetic disturbance.—Differences of as much as 8° from the normal variation have been observed along this section of the Columbia River.

Coal Creek Slough, at Mile 49.2 on the Washington side, empties into the river at **Stella.** It is used exclusively for log-raft storage. Depths over the bar are 3 to 4 feet, but deeper water extends nearly 3 miles above the entrance. Power cables over the deeper part of the slough have least clearance of 65 feet.

Fisher Island Slough, northward of Fisher Island, is used as the Longview Yacht Basin, by small fishing vessels, and as log-storage grounds. A depth of 7 feet may be carried through the channel.

A power cable over the main channel at Mile 54.5, at Lord Island, has a clearance of 120 feet.

The channel between Walker Island and the Oregon shore is used for log-raft storage. The shoal area, northward of **Dibblee Point,** limits the maximum depth which may be carried through the entire channel to about 7 feet. This channel is used as a shortcut by river boats during freshets. The power cable south of Lord Island has a clearance of 90 feet.

A large chemical plant is just westward of **Mount Coffin,** Mile 55.4. There is a wharf with a 500-foot face and reported depths of 32 feet alongside. There are dolphins 125 feet from either end of this wharf.

The **Longview Bridge,** at Mile 57.3 between Longview and Rainier, has a fixed span with a clearance of 185 feet. Fog signals are on the two piers of the bridge.

Longview, at Mile 58 on the Washington side, is a

major lumber port. The Port of Longview Authority manages most of the facilities. The bulkhead frontage includes more than 2,100 feet of modern dockside equipment and facilities, including two gantry cranes; depths of 35 feet are maintained alongside. Four large vessels can be handled alongside at the same time. Diesel and fuel oils, gasoline, lubricants, ice, and water are available in any quantity. Complete facilities are maintained for repair of vessels, except for drydocking. A small-craft boatyard here can haul out boats up to 10 tons. The grain elevator and the stacks and tanks of the mill are conspicuous.

Longview is a customs port of entry.

A Naval Reserve pier is at the west end of the Port of Longview wharf, just east of the bridge.

Cowlitz River flows into Columbia River at Mile 59, just eastward of Longview. Only small craft and pleasure boats ply the river, which has a reported depth of about 4 feet to Kelso, 4.8 miles above the mouth, and about 2 feet above there to **Toledo,** 29.5 miles upstream. The tide varies from 4 feet at the mouth to zero at **Ostrander,** 7.8 miles above the mouth. During ordinary freshets a stage of 20 feet and at extreme floods a stage of 25 feet is reached at Kelso.

Minimum clearance of the drawbridges across Cowlitz River between the mouth and Ostrander is 25 feet; minimum clearance for the fixed bridges is 64 feet. Two power cables near Ostrander have clearance of 72 feet, which is the minimum for such cables across the river. Drawbridge regulations are given in **203.765,** Chapter 2.

At **Kelso** there are several private wharves and one public landing. North of Kelso are log dumps.

Rainier, on the Oregon side opposite Longview, is used for some small-craft commerce. Depths along the waterfront are 20 to 24 feet. Two small boatyards have marine railways; maximum capacity is about 100 tons. Gasoline, ice, lubricants, and water are available; diesel oil is trucked in.

Carrolls Channel, between Cottonwood Island and the Washington shore of Columbia River, is used for log storage and fishing boats. About 13 feet can be carried through the channel.

A State fish hatchery is on **Kalama River** at Mile 63.4. **Kalama,** on the eastern bank about 3 miles above Cottonwood Island, has a fish wharf. Shingle and plywood mills are in operation. Small boats may obtain water and petroleum products by tank truck.

The channel circling the westerly side of **Sandy Island** is used by tugs hauling log rafts and barges; the controlling depth is about 8 feet.

Martin Slough, between Martin Island and Burke Island and the Washington shore, is used in log rafting operations, as is **Burke Slough** between Burke Island and the Washington shore.

Columbia City is a municipality at Mile 73 on the Oregon side. The main channel follows along the waterfront.

Saint Helens, at Mile 75 opposite the mouth of Lewis River, is the site of paper and lumber mills, the products of which are shipped in considerable quantities. During high water, large vessels require the assistance of tugs to be turned in the narrow basin off the dock. Municipal water is available on the dock in any quantity. Fuel for small boats is available at floating marine stations. The main wharf has a face over 1,300 feet long with a reported depth of 30 feet alongside.

Lewis River enters Columbia River at **Austin Point** (Chart 6154), Mile 75.7, on the Washington side. Depths are about 3 feet over the mouth, but just below the first bridge a bar reduces the depth to about 1 foot. Some logging and other traffic moves up to **Woodland,** 5.7 miles above the mouth, at high water. Drawbridge regulations are given in **203.765,** Chapter 2.

The railroad swing bridge, 1.8 miles above the mouth, has a clearance of 28 feet. The other bridges, all fixed, have clearances of 34 feet or more. Several cables cross the river.

Chart 6154.—From Saint Helens, Columbia River follows a southerly course to the mouth of the Willamette River, Mile 88, and then turns southeasterly to Vancouver, Mile 92.

Multnomah Channel is a 19-mile waterway separated from the Columbia River near Saint Helens and from the Willamette River near Portland by **Sauvie Island.** It is used by tows and small river boats during the winter when the main channel is discharging floe ice; logs are stored along the channel. Depths are 20 feet or more at the entrances, but decrease to 8 feet inside. A power cable about midway through the channel has a clearance of 100 feet. A fixed highway bridge near the southern end has a clearance of 78 feet.

Warrior Rock Light 2 (45°50.9′ N., 122°47.2′ W.), is shown from a white pyramidal structure on a stone pier near the northern end of Sauvie Island; a seasonal fog signal is sounded at the light. In thick fog vessels seldom attempt to pass the light; they anchor either above or below the point until the weather clears.

Local magnetic disturbance.—Differences of as much as 6° from the normal variation have been reported between Warrior Rock and the light off **Duck Club,** 1.5 miles southward.

Lake River, the outlet for **Vancouver Lake,** flows northward for 9.5 miles to its junction with Columbia River at the northern end of **Bachelor Island,** Mile 76. The controlling depth is 3 feet to **Ridgefield,** 2.5 miles above the mouth. There are some marginal wharves at Ridgefield; the principal traffic is floated logs. Power cables cross the river at several points.

Chart 6155.—At Mile 88, Columbia River is joined by **Willamette River,** its largest tributary below the Cascade Mountains. The Willamette drains a large territory, and is important as the site of the city of Portland, 9 miles above its mouth.

The Federal project depth in Willamette River is 35 feet to the Broadway Bridge in Portland; between this

span and Ross Island, the Port of Portland maintains the channel at 30 feet. For navigation regulations, see **207.670,** Chapter 2.

Overhead clearances are at Columbia River Datum.

Willamette River Light 44 (45°39.2′ N., 122°45.7′ W.) is shown from a pile structure near the end of the dike extending from **Kelley Point** on the eastern side of the entrance to the river; a seasonal fog signal is sounded at the light.

Columbia Slough, a narrow back channel roughly parallel to Columbia River, empties into the Willamette about 0.4 mile above its mouth. Least depth in the slough is about 4 feet. A dam has been constructed across the slough about 7.3 miles above the mouth, and a cross channel, **Peninsula Drainage Canal** dredged to Columbia River. Navigation consists principally of movements of log rafts to several shingle and lumber mills located on the slough.

The fixed bridges over the slough have least clearance of 27 feet. The least clearance of the power cables is 68 feet, at East St. Johns.

In the vicinity of **Post Office Bar Range,** 2 miles above the mouth of Willamette River, deep-draft vessels favor the west side of the river, while smaller vessels and tows usually hug the eastern side because of lesser current. A power cable with a clearance of 230 feet crosses the river 0.3 mile below the junction with Multnomah Channel. The twin towers supporting the cable are the most conspicuous features in this area.

Portland, on Willamette River about 9 miles from its mouth, is the principal city of the Columbia River system and one of the major ports on the Pacific coast. It has extensive commerce, both foreign and domestic, and is the port of call for many lines of coastwise, intercoastal, and transpacific steamships. The port is served by four transcontinental railroads. There are scores of docks and modern facilities along the 25 miles of deep-water frontage of both sides of the river. The terminal docks are equipped with the latest automated devices for fast handling of general cargo. Rail spurs serve all the big terminals.

The development, use, and administration of the harbor are concentrated in two autonomous commissions. The **Port of Portland Commission,** created by the State in 1891, operates Swan Island Ship Repair Yard and its contiguous expanse of industrial area, dredges the channel between Broadway and Ross Island Bridges, and assists the Corps of Engineers with other dredging in the Willamette and Columbia Rivers. The Port also operates two airports. The **Commission of Public Docks,** an agency of the City of Portland created in 1910, owns and operates most of the commercial docks and facilities. These are grouped in the three major terminals located downstream of Broadway Bridge. The dock commission is responsible for providing rapid-handling facilities at its terminals, as well as other modern equipment, so that the city can accommodate the largest vessels coming up the rivers.

Anchorages.—The anchorage generally used is from the Broadway Bridge downstream to the northern limits of the city, a short distance below municipal terminal No. 4, with depths of 30 to 35 feet.

Bridges.—The minimum clearance of the drawbridges is 26 feet at the Glisan Street vertical-lift bridge, 10.4 miles above the mouth; its raised clearance is 72 feet. The minimum fixed-span clearance is 120 feet at the Ross Island highway bridge. Drawspan regulations are given in **203.750,** Chapter 2. In 1962, a new double-decker fixed highway bridge was under construction 11.2 miles above the mouth, about midway between the Hawthorne and Ross Island bridges. All clearances are at Columbia River Datum.

The river is crossed near the north end of Ross Island by a power cable with clearances of 123 feet over the main channel and 83 feet over the east channel. About 0.4 mile southerly are cables with least clearance of 75 feet.

Ice forms occasionally, but it is seldom heavy enough to seriously affect navigation, although navigation by small vessels and river boats may be difficult.

Towage.—Every type of tugboat service is available here. No lighterage is necessary, but occasionally lumber is transferred by barge from mills to vessels.

Quarantine regulations of the U.S. Public Health Service are enforced. Vessels subject to quarantine usually proceed to their docks for inspection. A quarantine anchorage is just below municipal terminal No. 4 at Portland. Vessels may be deratized at either Astoria or Portland. An outpatient clinic of the Public Health Service is in the city.

Customs.—Portland is the headquarters of the customs collection district and a port of entry; marine documents are issued.

Immigration officials are stationed at Portland.

Harbor regulations.—The regulations are enforced by the harbormaster; copies of the regulations may be obtained from his office at the police harbor-patrol dock, foot of S.W. Clay Street.

Wharves.—There are docks and wharves capable of serving the largest vessels plying the river. Depths alongside the major terminals range from 20 to 35 feet. Storage facilities of all types are here, including a grain elevator with bins of total capacity of over 8,000,000 bushels. Dockside cranes have capacities ranging from 2 to 100 tons, and the barge cranes handle loads of 2 to 75 tons. The bulk unloader at Terminal 4 can move cargo at the rated capacity of 900 tons an hour. There are tanks for storage of molasses and heavier liquids, and the oil companies have their own unloading terminals and tank farms along the northwesterly banks of the river. Ample warehouse space is available at all times.

Supplies.—Fuel oil, gasoline, water, marine hardware, and groceries may be obtained in any quantity.

Repairs of all kinds can be made. The principal marine repair plant, maintained by the Port of Portland, is on Swan Island, on the east side of Willamette River. It is equipped with modern machinery. There are three drydocks here, the largest of which can lift 27,000 tons dead-

weight. It is 600 feet long over the keel blocks, with a depth over the blocks of 32 feet. Width between wings is 112 feet.

One well-equipped firm specializes in marine salvage in Portland. It has a 203-foot 3,600-horsepower converted LSM, equipped with 50-ton winches. Several firms undertake minor salvage work.

Communications.—All commercial methods of communcation are available out of Portland, including several transcontinental railroads. Radiotelephone service is handled through both Portland and Astoria.

Chart 6171.—Navigation of Willamette River above Portland is hazardous due to the rocks, shoaling bars, and strong currents. Local knowledge and midchannel courses are recommended. Federal project depths are 8 feet to Oregon City, thence 6 feet to Santiam River, 5 feet to Albany, and 2½ to 3½ feet to Corvallis, 115 miles above the mouth. These depths are usually maintained.

Below the falls at Oregon City, ordinary fluctuation of stage of water is 15 feet, and extreme fluctuation due to flood conditions is 30 to 50 feet. Above Oregon City, ordinary fluctuation is 12 to 20 feet, and extreme is 20 to 27 feet.

Clearances of bridges and cables are at Columbia River Datum below the Willamette Falls locks and at the low-water slope above the locks.

The river is marked with aids to navigation.

Between Portland and Willamette Falls most of the terminals are privately owned mill wharves and oil-receiving facilities. Above the falls are small privately owned wharves or natural landings.

Sellwood fixed highway bridge, 14.5 miles above, the mouth, has a clearance of 74 feet. Near the bridge on the east bank is a marina with docking facilities alongside the permanently moored old San Francisco ferry "Centennial Queen," now renamed "River Queen." Gasoline, oil, water small-craft repairs, and marine hardware are available.

There is a repair yard at **Milwaukie,** 16.2 miles above the mouth, that has a marine railway capable of hauling out craft up to 25 tons for hull and engine repairs.

A fixed railroad bridge, 17.4 miles above the mouth, has a clearance of 74 feet. The channel passes eastward of **Rocky Island,** 1.6 miles above the bridge. **Copeleys Rock,** 150 yards east of the south end of the island, is covered 10 feet and should be avoided.

Oregon City, on the east bank 22.6 miles above the mouth, is connected with **West Linn** by a fixed highway bridge which has a clearance of 74 feet. A power cable just north of the bridge has a clearance of 77 feet. Gasoline and oil are available at the northern limit of Oregon City.

Willamette Falls Canal, on the west bank 22.8 miles above the mouth, has five locks with a total lift of 50 feet; usable lock dimensions are 175 feet long, 37 feet wide, and 6 feet deep over the miter sills at low water. The least clearance of the power cables and pipeline that cross the canal is 72 feet. Regulations for the use, administration, and navigation of the canal and locks are given in **207.680,** Chapter 2. Upbound vessels may expect a delay through the locks during weekdays because of the downbound traffic from the papermill.

A warehouse and several buildings are on the west bank alongside the canal locks. An 850-foot timber wharf is on the east side of the canal.

A marina, on the east bank opposite **Willamette** and 24.3 miles above the mouth, has an elevator lift for hoisting boats up to 5 tons and 30 feet in length for hull and engine repairs. Gasoline, diesel oil, and water are obtainable.

From the entrance to **Tualatin River,** 24.8 miles above the mouth, for over 4 miles, Willamette River is shallow and winding; buoys and unlighted ranges mark the channel.

Power cables crossing the river at **Rock Island,** 26.1 miles above the mouth, have a least clearance of 123 feet.

Small craft can tie up at **Shanks Landing,** 28.8 miles above the mouth.

Chart 6172.—**Walnut Eddy** is on the east bank, 29.4 miles above the mouth. Cables with least clearance of 78 feet cross the river at **Buchmans Landing,** 0.4 mile above Walnut Eddy. About 0.7 mile above this landing is the Canby ferry, first of the three electric-powered ferries which carry autos and passengers across this river. A cable with a clearance of 75 feet crosses the river 32.5 miles above the mouth. Near **Wilsonville,** 33.7 miles above the mouth, there are two fixed bridges, highway and railroad, each with a clearance of 74 feet. A small-boat marina here has finger piers; gasoline can be obtained at the float.

At **Butteville,** 37.3 miles above the mouth, there are small-craft moorings. The power cable here has a clearance of 79 feet. The fixed highway bridge, 42.1 miles above the mouth, has a clearance of 68 feet at the main span. At **Newberg,** 43.4 miles above the mouth, there is a small-boat launching ramp, but no facilties. The Newberg highway bridge, has been closed and is scheduled to be removed. Its clearance is 88 feet.

From Newberg to Corvallis, Willamette River is more tortuous and turning, but not considered difficult for the small craft and occasional log-rafting tugs that use this section. The tributary **Yamhill River** empties into Willamette River about 3 miles above Newberg; navigation regulations are given in **207.690,** Chapter 2. Depths in Yamhill River of about 3 feet are reported to **Dayton,** 4 miles above its mouth.

The electric-powered Wheatland ferry crosses Willamette River at a point about 63 miles above the mouth. Vehicles and passengers are carried.

Salem, capital of the State of Oregon, is 73.6 miles above the mouth. Several moorings and docks for log-rafting and small craft are here; a marina just above the bridges has a small and steep marine railway which can handle about 1½ tons, for ordinary repairs. Gasoline, diesel oil, fresh water, and marine hardware are obtainable.

A power cable at the northerly city limits of Salem has a clearance of 86 feet. Minimum clearance of the bridges is 69 feet at the fixed highway bridges, and 42 feet down and 87 feet up at the railroad lift bridge.

At **Independence,** 83 miles above the mouth, there is a small-craft launching ramp, but no facilities.

Near the hamlet of **Buena Vista,** 92 miles above the mouth, the river is crossed by an electric-powered vehicular ferry.

Albany, 104 miles above the mouth, in 1962 had no facilities. Two bridges are here: a railroad swing bridge with clearance of 40 feet, and a fixed highway bridge with a clearance of 55 feet.

Corvallis, 114.4 miles above the mouth, is the limit of the Federal project of the river. Navigation is possible for another 35 miles to Eugene, but only for small craft in depths of about 2 feet.

There are small-craft finger piers and marginal facilities at Corvallis; gasoline and water are available. A highway bridge has a swing span with a clearance of 35 feet. See **203.755,** Chapter 2, for drawspan regulations.

Chart 6155.—The main channel of the Columbia extends along the Washington shore, northerly of **Hayden** and **Tomahawk Islands,** from the Willamette River entrance to and beyond Vancouver. Overhead clearances are at **Columbia River Datum.** Three bridges cross the main channel between Vancouver and Hayden Island. The railroad swing bridge at Mile 91.8 has a clearance of 39 feet. The Interstate Highway Bridge, Mile 92.5, has twin lift spans with clearances of 39 feet down and 175 feet up. A power cable crossing 0.2 mile eastward has a clearance of 220 feet. See **203.750,** Chapter 2, for drawspan regulations.

North Portland Harbor is that portion of the river channel between the Oregon shore and Hayden Island, the west end being at Mile 89.2. The controlling depth is about 10 feet through this waterway. Two bridges cross North Portland Harbor. The railroad bridge, 2.6 miles east of the westerly entrance, has a swing span with a clearance of 39 feet; see **203.750,** Chapter 2, for drawspan regulations. A fixed highway bridge a mile eastward has clearance of 34 feet.

It is reported that some of the stub piling of a former bridge remains below the water, 0.6 mile eastward of the fixed bridge, off Tomahawk Island.

Vancouver is on the Washington side of the Columbia River at Mile 92. The port is a water outlet for a large lumber-producing section in southwestern Washington, as well as a distributing point for a fair share of the grain produced in the interior of Washington and Oregon. Aluminum, paper products, and canned goods are also shipped.

Anchorages.—No defined areas have been specially designated as anchorage ground. Anchorage may be had near the outer part of the channel providing the center of the fairway is not obstructed.

For quarantine, customs, and **immigration,** see Portland.

Wharves.—There are two public terminals with bulkhead marginal wharves; depths alongside are about 27 feet. Three docks are privately owned, and all are equipped to handle general cargo in the foreign and domestic trade moving through this port. Open storage space totals more than half a million square feet, and covered space is less than half that, but ample for the demand. A large grain elevator is on the waterfront. Rail connections serve most of the facilities.

Supplies.—Fresh water and supplies are available. There are no fueling facilities for large vessels, but gasoline and diesel oil may be obtained.

Repairs.—Small-craft repairs can be made at a floating marina and repair houseboat, about a mile above the Interstate Bridge. A lift device inside the floating machine shop can haul 7 tons. Gasoline, diesel oil, lubricants, water, ice, and some hardware are available.

Chart 6156.—From Vancouver to Bonneville, Mile 126, Columbia River passes through the impressive **Columbia River Gorge,** flanked on each side by railroads and highways. Commerce on the river in this section consists mostly of pleasure craft and barges.

There are more than 35 dike dolphins along this portion, some are marked with lights at their ends. All the dikes are completely covered at higher stages, but bare approximately 6 feet at datum level.

A **measured nautical mile,** on course **107°,** is at **Lieser Point,** 3.6 miles above the Interstate Bridge at Vancouver. Each range is painted yellow with black stripes.

A special small-craft **anchorage area** is between Sand Island and Government Island; limits and regulations are given in **202.1** and **202.128,** Chapter 2.

Camas, at Mile 104.5 on the Washington side, has a large papermill which maintains its own wharf on **Camas Slough,** north of **Lady Island;** least depth in the westerly entrance is about 14 feet; the easterly entrance is foul and bares at low water. Most of the traffic in the slough is for the papermill which barges its products to Portland for reshipment. At high flood stages a current of as much as 5 knots prevails in the slough.

A new fixed highway bridge from the mainland to the east end of Lady Island was under construction in 1962; the design clearance is 32 feet.

Washougal is on the Washington side just eastward of Camas. The channel and turning basin serving the two cities were dredged to 27 feet in 1962, for a length of over 2,000 feet along the waterfront at **Parkersville.** A small-craft basin here can accommodate more than 150 boats at its moorings.

There are four power cables crossing at Ione **Reef,** south of Lady Island. The least clearance is 133 feet.

The entrance to **Sandy River,** on the Oregon side opposite Camas, bares at low water. The projecting shoal, **Sandy River Bar,** is dangerous to vessels making the turn south of **Ione Reef.** At higher flood stages, passage up Sandy River as far as **Troutdale** is possible.

Local magnetic disturbance.—Differences of as much as 8° from the normal variation have been observed between **Tunnel Point** and **Point Vancouver,** eastward of **Reed Island.**

Dangers.—In this section of the river, the principal hazards to navigation are the strong currents, rocks and rocky banks, winds and an accumulation of ice.

Currents.—In general, currents run fair with the main channels with considerable intensity, increasing in regions upstream toward Bonneville. Exceptions are the turn in the channel at Washougal Light 50, where a northwesterly set prevails; southwestward of **Cape Horn,** where a westward set is experienced; and the region between Fashion Reef Light and Multnomah Falls, where a southward set is experienced.

Weather.—Between **Corbett,** Mile 108, and The Dalles, Mile 165, the river flows between the bold mountains of the **Cascade Range.** In this stretch, winds of considerable force prevail during much of the time; generally they blow upstream in summer and downstream in winter. Daily peak velocities vary from 6 to 42 knots, but Corps of Engineers officials at Bonneville Dam measured gusts as high as 76 knots during 1960–1962.

Near **Warrendale,** Mile 122, the river becomes very constricted within less than a mile, and continues so almost to the approach to the locks of Bonneville Dam, at the lower end of **Bradford Island.**

Bonneville, on the Oregon side at Mile 126, is the headquarters of the U.S. Engineers in charge of the Bonneville Dam and lock. Fresh water may be obtained here.

Bonneville Dam, 126.3 miles above the mouth of Columbia River, is in two parts. The spillway is between the Washington shore and Bradford Island. The powerhouse and lock are between Bradford Island and the Oregon shore. The usable dimensions of the lock are: 500 feet long, and 76 feet wide. Usually the depth over the lower miter sill is greater than 24 feet. The vertical lift is 69 feet. The normal pool level is 72 feet above mean sea level. See **207.700,** Chapter 2, for operating regulations.

The highway bridge just west of the lock has a swing span with a clearance of 29 feet. The power cables have clearances of 196 feet south of Bradford Island and 78 feet north of it.

The superintendent of the lock may be contacted by radio on 2182 kc; the working frequency is 2784 kc.

Approaching Bonneville Lock from upstream, due to the strong current toward the powerhouse from the upstream lock approach, it is difficult to approach the lock at an angle and execute a turn in time to avoid an accident. Therefore, all craft approaching the lock from the east and pushing one or more barges should steer as close to the Oregon mainland shore as safety will permit, should be in line with the lock upon reaching the east end of the guide wall, and should continue at a steady but reduced speed if the lock is prepared for entrance and the signal for entrance has been given.

Chart 6157.—From Bonneville to The Dalles, the channel is the pool created by Bonneville Dam, which extends 40 miles to The Dalles Dam. Overhead clearances are at **normal pool level.**

Except for the rocky shoals at Cascade Rapids, where the controlling depth on the ranges is 27 feet, there is deep water throughout this section. The channels are marked by aids to navigation.

Tugboats use the eddy in the mouth of **Eagle Creek,** 0.6 mile above the lock, for mooring and shifting barges and log rafts. Small craft can find refuge here if the creek is not in flood.

Currents.—From the lock at Bonneville through Cascade Rapids, constant piloting is necessary because of the strong currents. From Cascade Rapids eastward, a set of 1° to 3° may be experienced depending on the angle that the course makes with the general direction of the river, the strength of the current, and the direction and strength of the wind.

Local magnetic disturbance.—Differences of as much as 6° from normal variation have been observed along this section of Columbia River.

Bridge of the Gods, 2.6 miles above the Bonneville Dam, has a fixed span with a clearance of 135 feet over a middle width of 284 feet.

Cascade Locks, 3 miles above the Bonneville Dam, have been drowned out. At normal stages of pool level the sides of the old chamber of the lock bare about 3 feet. This section of the lock makes a good anchorage, except for small boats in easterly weather; a strong current flows through the lock.

Along this section there are several inlets or rivers, generally used for log storage, where small craft may find refuge. Most are behind fixed bridges. These places, and their distances above the Bonneville Dam, are:

Rock Creek at **Stevenson, Wash.,** 4.2 miles; the bridge clearance is 18 feet. **Government Cove,** on the Oregon side, 5.6 miles. **Wind River** at **Home Valley, Wash.,** 8.1 miles; the highway bridge clearance is 21 feet. **Drano Lake,** near **Cook, Wash.,** 14.5 miles. The bridge clearance is 19 feet. **Ruthton, Oreg.,** 17.8 miles. **White Salmon River** at **Underwood, Wash.,** 20.9 miles. The bridge clearance is 26 feet.

Hood River, Oreg., 21.7 miles above the Bonneville Dam, is a town at the junction of Columbia and Hood Rivers. The small-craft basin, dredged to 20 feet in 1962, is administered by the Port of Hood River Commission. The basin entrance is marked by a light off the breakwater and a lighted range. A yard for building and repairing barges is here; gasoline, diesel oil, and fresh water are available.

The highway bridge over Columbia River, just above the basin, has a lift span with a clearance of 67 feet down and 148 feet up. See **203.759,** Chapter 2, for drawspan regulations.

There are power cables with clearance of 155 feet over the river at **Stanley Rock,** 22.9 miles above Bonneville Dam, and at **Crates Point,** 13 miles above Stanley Rock.

At **Bingen,** on the Washington side 23 miles above Bonneville Dam, there is a small-boat basin; in 1963 an entrance from the upstream end was under construction. Depths inside the basin are about 8 feet. Lights mark the entrances.

The Dalles is on the Oregon side of Columbia River, 39 miles above the Bonneville Dam. River traffic between

the town and Vancouver, consists mainly of petroleum products and general freight bound upstream, and wheat, wool, and rafted logs bound downstream.

A small-boat mooring basin with a breakwater and shear boom protection is just eastward of the city wharf. Depths inside are 4 to 7 feet.

The city wharf is over 1,000 feet long, and has ample warehouse facilities; depths alongside are about 20 feet. The municipal oil wharf is 193 feet long. There are also privately owned facilities for handling petroleum products and bulk grain.

Charts 6158–6162.—The Dalles Dam, 166 miles above the Columbia River mouth, has backed up the waters of that river to form Lake Celilo and thus provide slackwater navigation for 22 miles upstream to the John Day Dam, now under construction.

Traffic above The Dalles Dam consists mostly of grain and petroleum products.

Ice occasionally interferes with navigation for two weeks or more, usually in January or February.

Between The Dalles and McNary Dams there are no wharves, but a privately owned wooden fuel pier is at Umatilla, and grain elevators are at Umatilla, Arlington, and about 2 miles east of Paterson, Wash., 85 miles above The Dalles Dam. Grain elevators are also at points on, or close to, the river near Biggs, Rufus, and Blalock, Oreg., and at Roosevelt and Alderdale on the Washington side.

There are limited small-craft facilities at a few places. On the Deschutes and John Day Rivers, 11 and 23 miles, respectively, above The Dalles Dam, small boats find refuge inside the mouths. Caution is advised in entering, because of the low clearances of the bridges.

The Dalles Dam raises the water level approximately 88 feet to a normal pool level of 160 feet above mean sea level. The dam is 8,700 feet long. The navigation lock on the Washington side has usuable dimensions of; 675 feet long, 86 feet wide, a depth of 20 feet over the upper sill, 18 feet over the lower sill, and a vertical lift of 87½ feet. See **207.705,** Chapter 2, for operating regulations.

Lake Celilo, the pool created by The Dalles Dam, provides depths of better than 19 feet to the site of the John Day Dam. Above that point, the controlling depth is 5 feet until completion of the latter dam and its pool. The channels are marked by many ranges and buoys.

A fixed highway bridge across the downstream approach to the lock at The Dalles Dam has a clearance of 100 feet. The power cables at the upstream approach to the lock have a clearance of 125 feet.

A railroad bridge, 7 miles above The Dalles Dam, has a lift span with clearances of 20 feet down and 79 feet up. See **203.759a,** Chapter 2 for drawspan regulations. A power cable over the river, 0.2 mile west of the bridge, has a clearance of 123 feet.

At **Miller Island,** 10.5 miles above The Dalles Dam, the navigation channel is marked by ranges on both sides of the island. The main channel is along the north side of the island.

The Biggs Bridge, 13.6 miles above The Dalles Dam, has a clearance of 88 feet at the center of the fixed highway span. The bridge joins **Maryhill, Wash.,** and **Biggs Junction, Oreg.**

In 1962, the northerly half of the **John Day Dam,** 22 miles above The Dalles Dam, had been completed, and work was under way on the powerhouse section, the southerly half. The Corps of Engineers advised that navigation was being diverted through the lock, completed on the Washington side, and through a temporary channel dredged thence to the existing project channel about at the mouth of John Day River. This will prevail until completion of the dam and filling of the pool.

The lock is 675 feet long and 86 feet wide, with a normal lift of 105 feet. Depth over the upper sill is 23 feet, and over the lower sill, 20 feet.

In this section, the winding channel is marked by ranges at most of its critical turns.

A shoal with a least depth of 5 feet extends across the main channel on the **Blalock Rapids Range,** 38 miles above The Dalles Dam. The channel through the rapids is marked by buoys. Mariners should use caution in this area until the pool is eventually created.

A channel with a depth of 6 feet extends from the navigational channel in the Columbia River to the site of the port development at **Arlington,** Oreg., 43.5 miles above The Dalles Dam. A ferry crosses the river from Arlington to **Roosevelt,** Wash.

Moorage is available at Arlington for small craft at a float just west of the grain elevator. Gasoline, diesel oil, and fresh water may be obtained in the town. Several shops in the town can make emergency repairs.

A large letter **A,** formed by white-washed boulders, is set on the hill east of Arlington, and is visible as a prominent landmark to any vessel navigating upriver.

Blalock Island, 66.5 miles above The Dalles Dam, is the largest island in Columbia River between that dam and McNary Dam. The navigation channel follows the southerly side of the island; the north side is extremely rocky and narrow in places.

At **Boardman,** Oreg., 67 miles above The Dalles Dam, there is a small breakwater and a concrete launching ramp for small boats. Gasoline and water are availble in the town.

Umatilla, Oreg., 84 miles above The Dalles Dam, is the site of a private wooden fuel pier just east of the grain elevator. Barges tie up to dolphins at the grain elevator and along the shore at fuel tanks just west of the highway bridge. There is a small-boat basin 500 yards west of the highway bridge on the Oregon side.

The fixed highway bridge across the river, 85 miles above The Dalles Dam, near Umatilla, has two navigational spans, each with a clearance of 102 feet. The north opening is generally used during high water as there is less current, but during low water it is unsafe. The power cables eastward of the bridge have a least clearance of 99 feet.

Charts 6163, 6164.—McNary Dam, 253.5 miles above the mouth of Columbia River and just above Umatilla,

creates a pool extending about 55.6 miles upstream to a point 23.4 miles above Pasco, Wash. The dam raises the water level approximately 85 feet to a normal pool level of 340 feet above mean sea level. The navigation lock, on the Washington side, has usable dimensions of: 675 feet long, 86 feet wide, and a vertical lift of 92 feet. The depth over the lower miter sill is 12 feet and over the upper sill at normal pool, is 20 feet. See **207.715,** Chapter 2, for operating regulations.

Lake Wallula, the pool created by McNary Dam, provides a slack-water navigable channel with depths generally over 30 feet between McNary Dam and the confluence of **Yakima River,** a distance of about 37 miles. The channels to Richland, 40 miles above McNary Dam, are marked by aids to navigation.

Port Kelley, on the east side of Columbia River, 16 miles above McNary Dam, has a large grain elevator and facilities for handling bulk grain by rail, truck, or water. Unlighted ranges lead clear of the rock and shoal area in the middle ground 0.4 mile west of the facility.

Walla Walla River enters Columbia River on the east side 18.4 miles above McNary Dam. There is a small-boat moorage on the south side of the river just upstream from the abandoned highway bridge near the mouth.

Port of Walla Walla, on the east side 22.3 miles above McNary Dam, is an industrial port with no facilities.

The railroad bridge crossing Columbia River, 27 miles above McNary Dam, has a swing span with a clearance of 11 feet. See **203.760,** Chapter 2, for drawspan regulations.

Snake River, 282 miles above the mouth of Columbia River, rises in Yellowstone National Park, from which it winds southerly past the Grand Tetons, and thence for some 868 miles to its junction with the Columbia at Pasco, Wash.

From that junction for 119 miles to Lewiston there were almost no facilities in 1962, and only small-craft landings or launching ramps were available, notably at **Walker, Lyons Ferry, Central Ferry,** and **Silcott.**

Near its mouth, at the village of **Burbank**. Snake River is crossed by a railroad swing bridge with a clearance of 14 feet. About 0.6 mile above, there is a highway fixed bridge with a clearance of 61 feet. Some 0.8 mile above this bridge a power cable was reported to have a clearance of less than 60 feet.

East Pasco, on the north side of Snake River a mile above the mouth, has extensive storage for grain, petroleum products, cement, and ammonia; the wharves are privately owned. From East Pasco to Lewiston there are no usable wharves.

Ice Harbor Dam, 10 miles above the entrance, has a navigational lock 665 feet long and 86 feet wide. The single-lift lock provides a maximum lift of 103 feet; filling time is 12 minutes. Depths over the sills are 18 feet or better. See **207.716,** Chapter 2, for operating regulations.

The dam creates a pool that provides depths in slack water of 10 feet or more as far as the site of Lower Monumental Dam, 34 miles above the mouth. The latter dam is the next of three to be built to complete the project slack-water navigational channel to Lewiston, Idaho, 120 miles above the mouth. However, in 1962, the only navigation above Lower Monumental Dam site was at high water.

Chart 6164.—Pasco, on the north side of Columbia River 285 miles above its mouth, is 32 miles above McNary Dam. A public wharf is located here which is leased to private interests. There are extensive grain and petroleum storage facilities.

Kennewick, on the southerly side of Columbia River opposite Pasco, has grain storage facilities, a public wharf where dry cargo is moved, and an extensive small-craft harbor. The latter has some repair facilities, including a 15-ton crane; gasoline, lubricants, groceries, and some small-boat marine hardware are available.

Three bridges cross the river in this area; the railroad lift bridge clearance is 18 feet down and 70 feet up; see **203.760,** Chapter 2, for operating regulations. The two fixed highway bridges have clearances, respectively south to north, of 53 and 50 feet.

Richland, on the west side of Columbia River 40 miles above McNary Dam, has a small-boat moorage and marina where some topside repairs and accessories are available; gasoline, lubricants, and fresh water can be obtained.

Priest Rapids Dam, 68 miles above McNary Dam and 353 miles above the mouth of Columbia River, completed and dedicated in 1962, is the head of navigation, although in its construction provision was made for later building of a navigational lock if needed. However, Richland is the present practical head of navigation.

Charts 6168, 6169.—Franklin D. Roosevelt Lake, in the north central part of the State of Washington, is the longest artificial lake in the world. Formed by the waters impounded by **Grand Coulee Dam,** the lake extends about 125 miles along the Columbia River Canyon upstream from the dam to the International Boundary. In addition, the reservoir extends 26 miles up **Spokane River,** 8 miles up **Sanpoil River,** and 6 miles up **Kettle River,** all of which are now known as **arms** of the lake.

The maximum pool elevation is 1,290 feet above mean sea level, and all depths and overhead clearances are given according to this datum. The lake is subject to drawdowns which vary considerably from year to year. The maximum contemplated drawdown during seasons of extremely low natural flow conditions is 82 feet below normal lake level.

Bridges and cables.—There are several bridges and cables over navigable parts of the lake. The lowest bridge clearance, 29 feet, is at the fixed highway bridge over Spokane River Arm near its junction with the lake, and the lowest cable clearance, 43 feet, is near **Northport,** 116 miles above the dam. All clearances are increased to the extent of the drawdown of water from the lake at seasonal periods.

In river navigation, shoal areas, sand bars, submerged rocks, and other dangers are known or suspected. They

are particularly noticed upstream from Northport to the Canadian line, as well as in the Little Dalles area. Extreme caution should be exercised in navigating the Little Dalles area and upstream from Northport. The lake is well marked by lights and daybeacons.

An increasing traffic in small-boat operation has been observed on the lake by the National Park Service, which supervises the lake as a recreational area. It arranges camp and fuel sites, and as of 1962, had established a total of six small-craft fueling locations; North Marina, Port Spokane (on call), Daisy, Kettle Falls Marina, Lincoln Mill (emergency only), and Porcupine Bay.

The only commercial traffic on the lake is logging, by rafts or barge pushed by tugboat.

At a point about 17 miles above the dam, the Keller ferry crosses during daylight hours, the year-round. This is a State-owned ferry, carrying vehicles without charge. Another ferry operates between **Gifford** and **Inchelium,** 76 miles above the dam; this ferry occasionally must halt operations because of ice.

Hospital services are available at Coulee Dam and Colville. Northport is a customs port of entry.

11. COLUMBIA RIVER TO STRAIT OF JUAN DE FUCA, WASHINGTON

Chart 6002.—From Cape Disappointment, the coast extends northward for 22 miles to Willapa Bay as a low sandy beach, with sandy ridges about 20 feet high parallel with the shore. Back of the beach, the country is heavily wooded. Numerous summer resorts and cottages are along the beach.

Chart 6185.—Willapa Bay entrance is 24 miles northward of the Columbia River entrance. The bay with its several tributaries provides an outlet to an extensive area of valuable timber. Oyster beds cover much of the shoaler areas of the bay. Lumber and lumber products are the principal exports; fish and other sea foods are also shipped. The imports consist of general merchandise, mill machinery, and farming implements.

Prominent features.—Leadbetter Point, the southern point at the entrance of Willapa Bay, is low and sandy, with no distinctive feature to mark its extremity; the limit of the trees is 2.2 miles southward.

Cape Shoalwater, the northern point at the entrance, terminates in a low bluff about 50 feet high. The cape is sandy, and the northern portion is covered with trees to within 300 yards of the point.

Willapa Bay Light (46°44.1′ N., 124°04.6′ W.), 113 feet above the water, is shown from a white house on a skeleton tower on the north side of the entrance; a radiobeacon is at the station.

The northern shore of the entrance to the bay is marked by timbered bluffs and ridges, several hundred feet high. In the daytime, scars on the cliffs often are visible before the light can be seen. The termination of the tree line on Leadbetter Point is sharply defined.

The entrance is in the northern part of the bay, which consists of two arms; the southern, 16 miles long, and the eastern, 10 miles long. Both arms are filled with extensive shoals, large areas of which bare at low water. The southern arm is separated from the ocean by a strip of low sand and sand dunes, averaging 1.5 miles in width and covered with trees until within 2.2 miles of Leadbetter Point. Numerous cottages and summer resorts are along the seaward face of the narrow peninsula. The shores of the bay elsewhere are composed of low, rolling hills, 100 to 200 feet high, covered with dense growths of timber.

Willapa Bar extends about 3 miles outside of a line joining Willapa Bay Light and Leadbetter Point. The bar channel is continually shifting and depths over it vary from season to season. Historically, every 20 to 30 years the channel works to the southward until it is parallel with the shore, then breaks out to the westward. The buoys marking the channel through the bar are moved from time to time because of the shifting sands and changing channel. Dredging range lights are temporarily established at the entrance at times during dredging operations. They do not necessarily mark the best water.

Due to the changeable character of the entrance, vessels should always take a pilot.

Willapa River flows into the eastern arm of the bay. Aids to navigation mark the channel through the eastern arm, and Willapa River to South Bend and Raymond.

Channels.—Federal project depth is 26 feet over the bar and thence 24 feet into both forks of Willapa River. Although the bar is continually shifting, the entrance channel is restored to project depth as soon as possible after each change. The channel to the forks usually is within 2 or 3 feet of project depth.

Anchorage with good holding ground may be had at almost any point inside the bay. The anchorage generally used is off Toke Point in 30 to 55 feet, 4 miles eastward of Willapa Bay Light.

Tides.—The mean range of tide at South Bend is 7.8 feet. The range between mean lower low water and mean higher high water is 9.8 feet. A range of about 14 feet may occur at the time of maximum tides

Currents.—In the entrance the current velocity is about 2.5 knots. Currents of 4 to 6 knots occur at times, the velocity being greatest on the ebb, particularly with a southerly wind.

In the channel at South Bend, the velocity on the flood is about 1 knot and at ebb, 1.5 knots. Daily current predictions for both the entrance and South Bend may be obtained from the Tidal Current Tables.

See Appendix for **storm warning displays.**

Routes.—From northward or southward, the course to Willapa Bay should be shaped to make the outermost lighted whistle buoy. From seaward in clear weather, the lights at the entrance of Grays Harbor, 14 miles northward, and at North Head, 22 miles southward, are distinguishing marks for fixing a vessel's position and the subsequent shaping of the course.

Approaching from any direction in thick weather, great caution is essential. The currents are variable and uncertain. Velocities of 3 to 3.5 knots have been observed between Blunts Reef and the Swiftsure Bank, and velocities considerably in excess of these amounts have been reported. Under such conditions, vessels should not shoal the water to less than 20 fathoms until the lighted whistle buoy off the entrance has been made.

Strangers should not attempt to navigate the bay in thick weather. At any time, however, when the aids to navigation can be seen, vessels drawing 20 feet or less

should have little difficulty in reaching the wharves at Raymond or South Bend, as the channel throughout is well marked. Vessels of deeper draft should engage a pilot.

South Bend is on the southern bank of Willapa River, 3 miles above the mouth. The principal industries are lumbering, oystering and fishing; two canneries are operating here. Willapa Harbor Airport is on the north bank of the river about 2.5 miles northwestward of South Bend. **Raymond,** the principal town, is on the southern bank of Willapa River at the junction of the South Fork, 3 miles above South Bend. There are sawmills here, and large quantities of lumber are shipped out.

The main turning basin at the junction of the North and South Forks is used by ships up to 500 feet long and 24-foot draft. Ships turning usually head up the South Fork, back with the aid of a small tug into the North Fork, then straighten out down the main river.

Bridges.—There are no bridges over the main channel. A railroad drawbridge above the head of the project in South Fork has a clearance of 8 feet, and the railroad fixed bridge over the mouth of **Ellis Slough** has a clearance of 22 feet. Over North Fork, at Raymond, the highway bridge has a clearance of 14 feet; see **203.770,** Chapter 2, for drawspan regulations.

At the easterly edge of South Bend, the river is crossed by power cables with a clearance of 166 feet.

Pilotage.—Pilots may be obtained through the Grays and Willapa Pilots Association, Hoquiam, by calling Olympic Radio Company, Station KJQ, stating time of arrival off the bar. Deep-draft vessels should not attempt to enter without a pilot.

Towage.—Vessels desiring a tugboat may notify Station KJQ. Small power boats are also available.

Quarantine.—Vessels subject to quarantine usually proceed to their docks for inspection. A contract physician of the U.S. Public Health Service supervises quarantine and the outpatient office.

Customs.—South Bend is a port of entry.

Immigration.—Immigration is handled through the Aberdeen office of the U.S. Immigration Service.

Logging regulations for Willapa Bay and tributaries are given in **207.720,** Chapter 2.

Wharves.—The Port of Willapa Harbor maintains a terminal with a 600-foot wharf on the southern bank of the river between South Bend and Raymond; the depth along the face of the wharf is 24 feet. Depths alongside the major wharves range from 15 to 28 feet. Covered warehouse space is available. Lift trucks and a 30-ton crane are available.

Supplies.—Fuel oil, groceries, and water may be obtained at South Bend, Raymond, and at the Port of Willapa Harbor Terminal.

Repairs.—Marine railways in South Bend can haul out craft up to 100 tons for general repairs; there are machine shops and foundries nearby.

Tokeland, on Toke Point, is a summer resort. There is a small-craft basin at the point; depths of 10 feet in the entrance and 8 feet inside are maintained by the Port of Willapa Harbor.

A Coast Guard station is on Toke Point.

North River, which enters the eastern arm 2 miles east of Toke Point, is navigated by small logging launches. The channel is marked by privately maintained daybeacons, and is navigable at high water to **Eaton's Ranch,** 3 miles above the last daybeacon.

The channel to Bay Center is marked by lights and buoys. The directional light, 0.5 mile west-northwestward of Goose Point, should be used only with local knowledge as the beam may not always mark the best water, owing to the changing character of the channel. In 1962, the controlling depth was 7 feet to and inside the basin. The village of **Bay Center,** just south of **Goose Point,** is one of the many oyster places in this bay. There is also some fishing and crabbing.

Palix River, on the eastern side of the bay, is navigable for small logging tugboats and fishermen for about a mile up each of the three forks above the junction. The fixed highway bridge, about a mile below the forks, has a clearance of 15 feet.

Nemah River Channel, 5 miles south of Goose Point, is marked by privately maintained aids. Controlling depths are about 4 feet to the last daybeacon in the outer half, and 3 feet in the inner half.

Nahcotta, a small village 9 miles southward of Leadbetter Point, is the site of several large oyster packing plants. In 1962, the well marked channel leading to the village had a controlling depth of 8 feet.

Stanley Channel leads from **Nahcotta Channel,** at Long Island Shoal Light, eastward of Long Island and **Stanley Peninsula** to the mouth of Naselle River. Shallow-draft boats with local knowledge can cross **Long Island Shoal.**

Long Island, 5.5 miles long in a northwesterly direction and of irregular width, wooded, and rising to over 100 feet in elevation, lies in the southern arm of the bay near the head and nearly fills it.

Naselle River, on the eastern side of the bay, is navigable by boats of 5 feet or less draft, at half tide or higher water, as far as the bridge at the village of **Naselle,** 10 miles above the mouth. This bridge marks the head of tide water at ordinary high tides. A highway bridge over the river at **Mill Reach,** about 2.2 miles above the mouth, has a swing span with a clearance of 9 feet. The signal for opening the drawspan is 4 long blasts. Between the bridges the river has numerous snags and submerged logs, and is crossed by power cables with least clearance of 35 feet; passage should not be attempted without local knowledge. Small logging and fishing boats operate on the river.

Bear River enters at the southeastern corner at the head of **Shoalwater Bay.** A long, tortuous, unmarked channel across the flats makes entrance to the river difficult. Vessels of 5-foot draft or less can make the fixed bridge about 1.5 miles above the mouth at half tide.

Chart 6002.—From Cape Shoalwater to Point Chehalis, the southern point at the entrance to Grays Harbor, the

coast extends for 12 miles as a low sand beach, backed by a heavy growth of timber.

Chart 6195.—Grays Harbor entrance is about 40 miles northward of Cape Disappointment and 93 miles southward of Cape Flattery. The bay and its tributaries furnish an outlet to an extensive timber area. Grays Harbor is an important west coast port in the foreign and domestic trade. Oil is delivered in large tankers.

The bay at the entrance is about 2 miles in width, but shoals extending southward from Point Brown contract the navigable channel to a width of 0.4 mile. From its entrance the bay extends eastward for 15 miles to the mouth of Chehalis River. The bay is filled by shoals and flats; these bare at low water and are cut by numerous channels.

Point Chehalis is low and sandy, and is bare of trees for 1.5 miles southward of its extremity. A jetty extends seaward from the end of the point.

Grays Harbor Light (46°53.3′ N., 124°06.9′ W.), 123 feet above the water, is shown from a 107-foot white octagonal pyramidal tower on the seaward side of Point Chehalis. The radiobeacon and fog signal are 1.1 miles northward of the light.

Point Brown, the northern entrance point, is 2.5 miles northward at Point Chehalis; it is low, rounding, and sandy, with shoals extending southward and westward, which, together with those extending westward from Point Chehalis, form the bar at the entrance. The point is wooded to within 0.5 mile of the extremity. A jetty extends southwestward from the point.

Prominent features.—The country about Grays Harbor is flat and featureless, with few conspicuous objects. **Saddle Hill** (Chart 6002), about 310 feet high, 8 miles northward of the entrance and 2 miles inshore, is the most conspicuous feature.

Grays Harbor Light shows prominently on a closer approach to the entrance. In clear weather, **Brackenridge Bluff,** on the northern shore 6 miles inside the entrance, is quite prominent. It is a reddish cliff about a mile long, rising in two places to a height of 80 feet; from seaward it is visible only through the entrance.

In clear weather **Neds Rock,** off Brackenridge Bluff, shows prominently from inside the entrance; it is reddish in color.

The entrance is between two jetties. In 1962, the south jetty was being rebuilt, but more than half of it was then still awash or covered at low water. The entrance is marked by a lighted range and other aids.

Channels.—Federal project depth is 30 feet to Cosmopolis. The channel usually is within 3 feet of project depth between maintenance dredgings. The jettied entrance, which formerly was unstable, now has deep water throughout and no longer requires extensive dredging; there is a tendency to shoal at the curve of the Point Chehalis side. There is no deep-draft navigation above Cosmopolis; depths of 9 feet are reported available to Montesano.

Anchorage.—The best anchorage is southward of Sand Island Shoal, in 35 to 40 feet. The holding ground is good, and there is more swing room here than elsewhere in the harbor.

Tides.—The mean range of tide at Aberdeen is 7.8 feet. The range between mean lower low water and mean higher high water is 9.9 feet. A range of about 14 feet may occur at the time of maximum tides. Daily tide predictions for Aberdeen are given in the Tide Tables.

Currents.—In the entrance the current velocity is about 2.5 knots, but velocities up to 5 knots may occur. In the channels through the bay the velocities seldom exceed 3 knots. The master of the dredge working on the bar states that the currents are very erratic. He usually experienced a northerly set close inshore and and a southerly set offshore. Daily predictions are given in the Tidal Current Tables.

See Appendix for **storm warning displays.**

Routes.—From northward or southward, the course should be shaped to make the entrance buoy. From seaward in clear weather, Saddle Hill, 8 miles northward of the entrance, and Grays Harbor Light on Point Chehalis, will be seen.

Approaching from any direction in thick weather, great caution is essential. The currents are variable and uncertain. Velocities of 3 to 3½ knots have been observed between Blunts Reef and Swiftsure Bank, and velocities in excess of these amounts have been reported. Under such conditions vessels should not shoal the depths to less than 20 fathoms unless sure of the position.

Strangers are advised to take a pilot, and in no case should they attempt to cross the bar when it is breaking.

At any time when the aids to navigation can be seen, vessels of 20 feet or less draft, having crossed the bar, should have no difficulty in reaching the wharves at Hoquiam or Aberdeen. The channels should not be attempted in thick weather.

Pilotage.—Pilots may be obtained from the Grays and Willapa Pilots Association, Hoquiam, through Olympic Radio Company, KJQ, stating the time of arrival off the bar. Pilots also may be obtained off the entrance by signals which are relayed by the Coast Guard lookout station on Point Chehalis.

Vessels proceeding to Grays Harbor from Columbia River, Willapa Bay, or Puget Sound ports can usually make arrangements with the pilot association to send a pilot to the port of departure, thereby avoiding delay at the entrance due to fog or stormy weather. Information relative to conditions on the bar can be obtained by radio from the pilot association. It is advisable to notify the stevedoring companies as far in advance as possible as to the time of arrival off the bar and the nature of the cargo to be handled.

Westport Harbor (Westhaven Cove), on the inner side of the north tip of Point Chehalis, is protected by breakwaters marked by lights. The cove is headquarters for many fishing boats: the fish pack is moved by truck from the town.

Federal project depth in the entrance channel is 16 feet, which is maintained. Depths are 12 to 16 feet alongside the principal wharves in the cove.

A Coast Guard station is on the west side of Westport Harbor. **Westport** is a summer resort and fishing town on Point Chehalis.

Bay City, 3.7 miles southeasterly from Westport Harbor, on the eastern shore of **South Bay,** formerly was a whaling station. The wharf built originally for the old fertilizer factory is now in ruins. The fixed highway bridge at Bay City has a clearance of 35 feet.

For the remainder of the 2.6-mile distance, South Bay is crooked and full of shoals to the mouth of **Elk River,** which is used some for logging.

Markham, site of a large cranberry-packing plant, is on the south side of the bay at the mouth of **Johns River,** a shallow stream crossed by a fixed highway bridge with clearance of 33 feet, near the entrance. Above this, the stream is navigable only for rowboats.

Hoquiam and **Aberdeen** are twin cities about 14 miles above the harbor entrance. Hoquiam is on the river of that name, and Aberdeen is on Chehalis River. Depths along the wharves range from 10 to 30 feet. South Aberdeen is across the river, but is part of the city of Aberdeen.

Cosmopolis is a small town on the southern side of Chehalis River just above South Aberdeen. There is a large pulpmill here.

Chehalis River enters at the eastern end of Grays Harbor and is marked by lights. It is navigable by small boats to **Elma,** 24 miles above the mouth. The upper portion of the river, for a distance of approximately 45 miles above Elma, is used for floating logs.

Montesano, about 14 miles above Aberdeen, has several mills. This stretch of the river is used only by log tows.

Towage.—Tugboats are available for use inside the harbor. Open barges can be obtained.

Bridges.—The main channel is crossed by only two bridges at Aberdeen, the railroad swing and highway bascule bridges 1.4 miles above Cow Point; the minimum clearance is 8 feet. At South Montesano is a railroad swing bridge with a clearance of 8 feet and just above it the fixed highway bridge has a clearance of 29 feet. In the 6-mile stretch between Montesano and Elma there are two fixed bridges having least clearances of 8 feet. At Cosmopolis, 5.5 miles above the mouth, is a power cable with a clearance of 125 feet. Above this point, minimum cable clearance is 50 feet.

Hoquiam River is crossed by three drawbridges within 0.6 mile of the mouth; least clearance is 8 feet. The river above this is crossed by several bridges and cables. Wishkah River is crossed by two drawbridges within 0.2 mile of the mouth; least clearance is 8 feet. A bascule drawbridge, a mile above the mouth, has a clearance of 11 feet. Clearance of the power cable near the bridge is 75 feet. See **203.775,** Chapter 2, for drawspan regulations.

Quarantine regulations of the Public Health Service are enforced. Vessels subject to quarantine inspection are boarded at their first berth. An outpatient office of the Public Health Service is in Aberdeen.

Customs.—Aberdeen is a port of entry; marine documents are issued.

Immigration.—The Immigration Service maintains an office at Aberdeen.

The **Coast Guard office** is at Hoquiam.

Harbor regulations.—The Port of Grays Harbor Commission directs the facilities and port affairs of the harbor district, which is co-extensive with Grays Harbor County. All terminal charges are fixed by the commission. The office of the Port of Grays Harbor is at the foot of Myrtle Street in Aberdeen, where copies of the regulations may be obtained.

Logging regulations for Grays Harbor and tributaries are given in **207.730,** Chapter 2.

Wharves.—The Port of Grays Harbor operates a modern freight terminal with two slips maintained to depths of 30 feet. Berths are available to accommodate four vessels, each of more than 500 feet in length. The terminal has gantry cranes and other equipment to handle lumber and all types of cargo. Fuel oil connections are on the docks. Adequate storage space, covered and open, is available. In addition to the port commission facilities, private berthing space elsewhere in the harbor totals more than 2,000 feet.

Supplies.—Fuel oils, water, marine hardware, and groceries are available.

Repairs.—There are marine railways, the largest of which can haul out vessels up to 250 tons. Machine shops and foundries can make ordinary repairs.

Communications.—Grays Harbor is served by transcontinental railroads, and a large number of ships operating in foreign and intercoastal trade. **Bowerman Airport** is on the extensive filled area just westward of Hoquiam.

North Bay, on the northern shore immediately eastward of Point Brown, is a shallow bight about 4 miles in length. It is filled with shoals and flats that bare at low water. There is some oyster culture in the bay which is used considerably by small oyster boats.

Hoquiam River empties into Grays Harbor about 2 miles westward of the mouth of Chehalis River. It is practically a tidal slough 11 miles long. Except for the depths of 22 feet or better to the industrial facilities near the mouth, not more than 10 feet can be taken up to the branches.

Wishkah River empties into the north side of Chehalis River in the eastern part of Aberdeen. It is little used.

Chart 6002.—From Point Brown the coast extends northward for 22 miles to Point Grenville as a low, sandy beach, broken occasionally by small streams and in some places by bluffs. A few small towns and settlements, connected by roads or trails, are scattered along this stretch.

Copalis Head, 13 miles northward of Point Brown, is a bright yellow bluff 2 miles long and 200 feet high. It is 1.8 miles northward of **Copalis River. Copalis Rocks,** two small rocks the larger 34 feet high, lie 500 yards off the head, and a rock awash is about 0.5 mile west-southwestward of the head.

Two small bluffs mark the mouth of **Joe Creek,** 3.5 miles northward of Copalis Head.

Moclips River entrance is 6 miles northward of Copalis

Head. The southern point at the mouth is bare and sandy; on the northern bank is a bright yellowish bluff 50 feet high. **Moclips,** near the mouth of this river, is connected by a branch of the Northern Pacific Railway with Hoquiam on the north shore of Grays Harbor. The tanks and stacks are prominent from seaward. A triangular shaped yellowish bluff about 110 feet high on the south bank of **Wreck Creek,** which empties about 2.5 miles northward of Moclips, is prominent from offshore.

Point Grenville, 10 miles north of Copalis Head, is a broken rocky promontory with nearly vertical whitish cliffs over 100 feet high. A Loran tower, 300 feet high with a flashing red light at the top and two fixed red lights at levels 100 feet and 200 feet below the top, is on the point. Numerous rocks extend for some distance off the point. **Grenville Arch,** dark in color, 83 feet high, is the outer and more prominent of two rocks lying westward of the point; it is over 0.5 mile southwestward of the inner extremity of the point. The arch lies east and west. A rock that uncovers lies 400 yards northwest of Grenville Arch. The western rock, off the western end of the point, is 200 yards off the cliff and 92 feet high. There are several rocks inside of it but none outside. Two rocks, over 90 feet high, lie 400 yards southward of the southern extremity of the point.

An indifferent anchorage in northwesterly weather may be had under Point Grenville by vessels of moderate draft, but the depths compel anchoring at such a distance from the beach that little shelter is afforded. The anchorage is in 4 fathoms, sandy bottom, with the inner extremity of the point bearing 338°, and Grenville Arch bearing 293°. This anchorage is not recommended for ordinary use.

Northward of Point Grenville is a series of cliffs, the upper part appearing light gray, the lower part dark, separated by a well-defined line of demarcation. This formation disappears near the southern end of the cliffs where they are broken up and present a stratified appearance, the strata having a downward slope to the northward. Northward of the cliffs is a shingle beach followed by irregular bluffs and cliffs terminating near Taholah in white cliffs of uniform height, which from offshore do not present the stratified appearance noticeable to the southward.

Quinault River breaks through the cliffs about a mile southward of Cape Elizabeth. **Taholah** is an Indian village on the banks of the river. The shoreline in this section is low. The river is navigable only by skiffs and outboard motorboats. Some gasoline and supplies are available. A piling dike has been built along the spit in front of the village. In the background is a ridge with three long, flat summits. The road serving the beach settlements, and connecting them with Hoquiam, terminates at Taholah.

From Taholah to Cape Elizabeth the cliffs present an almost unbroken face seaward, and in places are about 200 feet high. They appear either white or bright yellow in color, and from offshore present a very noticeable stratification, sloping downward to the southward; an important difference from the direction of slope around Point Grenville.

Sonora Reef extends south-southeastward from Cape Elizabeth for over 2 miles, its southern end lying 1.1 miles offshore.

Cape Elizabeth projects about a mile from the general trend of the coast, and when seen from seaward appears as a bright yellow, rocky cliff reaching in places a height of 200 feet. There are no high or large rocks off the cape. A little less than a mile south-southeastward and south-southwestward, lie two rocks awash, and inside of these, less than 0.5 mile from the extremity of the cape, are some small visible rocks and breaks. The houses of the Quinault Indian Reservation are at the eastern end of the cliffs.

From Cape Elizabeth for 20 miles to Destruction Island, the coast is nearly straight, with low shores and rocky cliffs heavily wooded to the edges. Numerous rocks lie offshore, but these are inshore of the usual track of vessels.

Flat Rock, low and black, lies 1.6 miles northwestward from Cape Elizabeth and 0.9 mile offshore. A covered rock which breaks in ordinary weather lies 400 yards southward of it. A small rock lies halfway between Flat Rock and Cape Elizabeth, with a smaller one inside halfway to the beach.

Pratt Cliff, 3 miles northward of Cape Elizabeth, is a sharp point backed by cliffs, 139 feet high. **Split Rock,** 70 feet high, is 1 mile offshore, abreast of the northern end of Pratt Cliff. It is split in two, the division showing when seen from westward to northwestward. A small, low, black rock lies 0.5 mile southward of it, and a larger one lies 0.4 mile southward of Split Rock.

Willoughby Rock, 120 feet high, 0.4 mile northeast by east of Split Rock, is nearly round with an abrupt seaward face. A cluster of rocks lies between Willoughby and Split Rocks and a little southward of them; one is black and conical, with a rock awash 200 yards southwestward from it.

Scalion Rock, 8 feet high, small and black, is 3 miles northwest by north of Split Rock and 2.8 miles offshore.

From Pratt Cliff to **Raft River,** 3.5 miles, the coast consists of broken cliffs over 100 feet high bordered by rocks extending over 0.5 mile offshore. Midway between these points are three rocky heads covered with trees to the edges projecting beyond the cliffs and almost detached from them.

Tunnel Island, 157 feet high, lies in the entrance to Raft River, and at low water is connected with the southern point of the river. A vertical pillar, 108 feet high, stands 150 yards north-northwestward of the rocks, and a cluster of rocks lies close-to under its southeastern point.

From Raft River to Queets River, 4.5 miles, the coast consists of cliffs about 80 feet high, broken occasionally by small streams.

Queets River is the largest stream between Grays Harbor and Cape Flattery. The southern point is a low, sandy spit about 0.1 mile long, projecting from an abrupt cliff, 80 feet high, and densely wooded. The northern point is 1.3 miles long, low, and sandy, with some trees at the mouth of the river, and a narrow lagoon between it and the bluff.

From Queets River for 10 miles to abreast Destruction Island, the coast is rather low, and is broken by cliffs about 50 feet high with broad low-water beaches. **Kalaloch Rocks** lie about 4.5 miles northward of the river, close inshore.

Destruction Island, 90 feet high, is 20 miles northward of Cape Elizabeth and 3 miles offshore. It is flat-topped and covered with brush, with a few clumps of trees. The island is 0.5 mile long and, at its southern part, 300 yards wide. From the northern end rocks and ledges extend about a mile from the cliffs; these are bordered by a line of kelp on the inshore side.

Destruction Island Light (47°40.5′ N., 124°29.1′ W.), 147 feet above the water, is shown from a 94-foot white conical tower on the southwestern part of the island; a radiobeacon and fog signal are at the station.

An indifferent anchorage, affording shelter from northwesterly winds, may be had off the southeastern face of the island in 12 fathoms, sandy bottom, with the light bearing between 293° and 315°. Vessels must leave if the wind hauls westward or southward. During the fishing season many small fishing boats anchor for the night under Destruction Island; it is the only shelter from offshore winds between Grays Harbor and Cape Flattery.

Chart 6102.—For 6.5 miles from Destruction Island to Hoh Head, the coast trends in a general northwesterly direction. The cliffs are 50 to 100 feet high, and many rocks and ledges extend 1.2 miles offshore in some places.

Abbey Islet, 3.5 miles northeastward of Destruction Island, is over 100 feet high and covered with trees. It is 200 yards off the cliffs. Many rocks lie close southward of it, the most distant of which is **South Rock,** 46 feet high, 1 mile southward and 0.5 mile offshore.

At the mouth of **Hoh River,** 2 miles eastward of Hoh Head, is a broad sand beach; the absence of cliffs for 0.5 mile is noticeable for a considerable distance offshore. In smooth weather the river can be entered by canoes, but the channel shifts. An Indian village is on the southern bank at its mouth.

Hoh Head, 200 feet high, is a bright yellow cliff covered with a dense forest. It projects a little over 0.5 mile from the general trend of the coast. A large cluster of rocks is off the southern cliff of the head and covered rocks extend to about 1.6 miles offshore between the head and North Rock. A rock covered 2¼ fathoms lies 1.8 miles west-northwestward of Hoh Head.

Middle Rock, North Rock, and **Perkins Reef** are other dangers within 1.5 miles off Hoh Head. Middle Rock, 65 feet high and black with vertical sides, is 0.8 mile off the mouth of Hoh River. North Rock, a mile southward of Hoh Head, is 107 feet high and grayish in color, with steep sides; in the afternoon sun this rock shows white, which makes it a very distinct landmark. Perkins Reef is a long, bold, and jagged islet, 1.1 miles westward of Hoh Head. In this area there are numerous other rocks, covered and bare.

The coast continues rugged and rocky from Hoh Head to La Push, 11 miles to the northwest. The cliffs are 100 to 120 feet high, broken here and there by small streams. Several rocky islets 25 to 120 feet high and covered ledges extend in some places as much as 2 miles offshore.

Alexander Island, 121 feet high, is 2 miles northward of Hoh Head and a mile offshore. It is covered with low vegetation, and is flat-topped with steep sides. The island is prominent in hazy or smoky weather. A covered rock, 1.8 miles west by north of Alexander Island, is the outermost known danger in this vicinity.

Toleak Point, 4.7 miles northwest of Hoh Head, is a narrow point terminating in a small knob with an abrupt seaward face. A high wooded islet lies 400 yards westward of the point, to which it is connected by an extensive bare reef. **Rounded Islet,** a grassy rock 130 feet high with steep sides, is 0.3 mile seaward of Toleak Point. A low black rock is 0.7 mile southward of the islet.

Giants Graveyard, 1.5 miles northward of Toleak Point, consists of very irregular rocks, the largest of which are up to 210 feet high. The farthest offlying one is about 0.8 mile from shore.

Teahwhit Head, 8 miles north-northwest of Hoh Head and 2.4 miles south-southeast of La Push, is a jagged double point 100 feet high and heavily wooded. **Strawberry Bay,** on the southeast side of the head, is a small bight in which fishing boats find shelter from northwest winds. There are numerous rocks in and around the bight.

Quillayute Needle, 81 feet high, 1.3 miles west-northwestward of Teahwhit Head, is the outermost of many rocks, visible or covered, that lie within a mile of the shore. Some are as high as 100 to 195 feet, and many are awash or covered by a fathom or less. The foul area continues to James Island, at the entrance to La Push.

James Island, 15 miles northwestward of Destruction Island on the north side of Quillayute River mouth, is 183 feet high, bold and wooded, and joined to the beach at low water. Numerous smaller wooded islands, immediately northward, are prominent. An indifferent anchorage affording some shelter from northwesterly winds may be had close southward of James Island, in 5 to 6 fathoms, sandy bottom, about 600 yards from the beach. Any swell makes this anchorage unsafe.

James Island Light (47°54.3′ N., 124°38.8′ W.), 150 feet above the water, is shown from a white house on the southerly part of the island. A radiobeacon and fog signal are at the light. A lighted whistle buoy, 3.3 miles southwest of the light, marks the entrance.

La Push, an Indian village on the southerly side of **Quillayute River,** has extensive sport-fishing facilities and supplies. The entrance is protected by a jetty on the southeasterly side and a dike on the northwesterly side. The Federal project depth is 10 feet from the sea to the basin; in 1962, the channel was at project depth, and protective diking was under construction to provide adequate depths in the small-craft basin.

The channel, which passes close to the southeastern shore of James Island, is tortuous and dangerous. It is especially bad in southerly weather. When there are breakers of any size making across the entrance it should

not be attempted except at better than half tide and with a full-powered boat. Strangers should take a local pilot. A power cable with a clearance of about 100 feet crosses the river near its mouth.

Fishing boats can enter and leave the river at any time during the year except in southerly weather.

A Coast Guard station is at La Push. See Appendix for **storm warning displays.**

Gasoline, diesel oil, water, ice, groceries, and some marine hardware are available. There is a good highway to Forks.

From James Island north-northwesterly for 16.4 miles to Cape Alava, the rugged coast continues, with rocks and foul ground extending as much as 2 miles offshore; the land side consists of steep wooded bluffs and narrow beaches. The cliffs, however, are not continuous. The densely timbered country ascends gradually eastward to the snow-capped mountains of the Olympic Range, which can be seen for many miles in clear weather.

Cake Rock, 116 feet high, is 2 miles northwest of James Island and 1.5 miles offshore. This rock, about 200 yards long, has steep sides and its flat top is surmounted by a 20-foot mound. There are several other visible rocks between Cake Rock and the shore.

Cape Johnson, small and not particularly prominent, projects less than 0.5 mile from the coastline, terminating in a vertical cliff 100 feet high.

Jagged Islet, 78 feet high, 2.6 miles northwestward of Cape Johnson, is large, brown, covered with guano, and irregular in outline. A low black rock lies 200 yards northward. **Carroll Islet,** 225 feet high, is 0.8 mile northward of Jagged Islet. It has vertical whitish sides and wooded top. A pillar rock, 134 feet high, lies 200 yards westward, and a low black rock is 200 yards off the southeastern side. Carroll Islet and the pillar rock are quite prominent, especially in the sunlight.

Bald Islets are two high, bare rocks inside of Jagged and Carroll Islets about 0.8 mile offshore. The outer and larger one is 320 feet high with steep sides, and the smaller is 183 feet high. They are 200 yards apart and between them are two pinnacle rocks close together. Many other rocks are shoreward of the islets.

Hand Rock, 33 feet high, is 1.5 miles northward of Carroll Islet and 1.5 miles offshore. So named from its shape, the rock is black with a white cap of guano on top.

White Rock, 161 feet high, 1.7 miles south of Cape Alava and about 0.8 mile offshore, has nearly vertical sides and a rounded top; it is whitish, and in the sunlight is visible for a long distance. A group of large, low, black rocks lie 0.8 mile south-southeastward of White Rock and 0.8 mile offshore. A rock covered 6 fathoms is 2.2 miles westerly of White Rock.

Chart 6265.—Cape Alava, the westernmost point of the State of Washington, is 13 miles southward of Cape Flattery. The seaward face is about 0.6 mile in extent. A steep rocky islet, 142 feet high and with trees on top, is off its northwestern extremity. The shore is bordered by numerous rocks and covered ledges.

Flattery Rocks and Umatilla Reef are rocks and islets extending westward from Cape Alava for 2.3 miles. **Ozette Island,** 236 feet high, is 0.8 mile southwestward of the cape. The island, 0.5 mile long, is flat-topped with steep sides. About 0.3 mile off the southern and southeastern sides are low, black rocks. **Bodelteh Islands,** 1.2 miles west-northwest of the northerly end of Cape Alava, have high bold seaward faces. The outer one is 198 feet high.

In season, a few fishermen find shelter in an anchorage off the southeastern end of Ozette Island. The area is small and requires local knowledge to enter. It affords fair protection from the prevailing northwesterly wind.

Umatilla Reef, 2.3 miles northwestward of Cape Alava, the greatest danger to navigation off the northern coast, lies 0.7 mile westward of the outer Bodelteh Island. It extends for 200 yards in a westerly direction and is about 75 yards wide. The reef consists of small, low, black rocks and some breakers. There is a reported breaker 1.1 miles northeast by north of this reef, and a rock awash, 0.3 mile east of the reef, which endangers the passage inside Umatilla Reef, sometimes used by small boats. Umatilla Reef is difficult to make out, especially in thick weather.

Umatilla Reef Lightship (48°10.0′ N., 124°50.4′ W.), is about 2.5 miles southwestward of the reef. The vessel has a red hull with the name UMATILLA in large white letters on the sides. The light is 56 feet above the water; a radiobeacon and fog signal are at the lightship. The code flag signal and radio call is NNCL. **Storm warnings** are displayed in daytime only.

Between Cape Alava and Cape Flattery, the coast curves slightly eastward in a series of bights, but continues as rugged as before. There are alternate stretches of wooded bluffs and high rocky cliffs. The country immediately back of the beach is not high, but it is densely wooded.

Point of the Arches, 5 miles northward of Cape Alava, is the northern point of the cliffs that extend some 1.5 miles southerly. Numerous rocks and ledges are offshore as far as about a mile.

Father and Son, two rocks connected by a low reef, lie 0.6 mile offshore abreast the southern end of the cliffs. The outer rock is 167 feet high, and the inner one 65 feet. From here to Spike Rock there are several exposed rocks.

Spike Rock, 35 feet high, sharp and bare, is 0.8 mile northwestward of the Point of the Arches. It is the outermost of a chain of rocks, the largest of which is 185 feet high; there are three arches in these rocks. A rock awash is 0.4 mile west-southwest of Spike Rock.

Portage Head, 2.5 miles northward of Point of the Arches, has a mile-long seaward face of bold irregular cliffs over 410 feet high. A reef extends from the point toward Cape Flattery for 1.5 miles showing several low, black rocks awash, and one small rock 45 feet high. A rock that uncovers is 1.3 miles northwestward of Portage Head.

Mukkaw Bay is a shallow bight included between Portage Head and Waatch Point. It affords indifferent shelter in northerly and easterly weather and a smooth sea, but is little used. During salmon runs many native

pulling boats beach there at night. The shores are low and sandy. **Waatch River** enters in the northern part of the bight immediately eastward of Waatch Point. It is a tidal slough, and the valley through which it runs extends about 2 miles to Neah Bay on the Strait of Juan de Fuca. This low depression is one of the features for recognizing Cape Flattery.

Waatch Point, 3 miles southeastward of Cape Flattery, is the southeastern extremity of the cliffs extending to the cape. This stretch is bordered by numerous rocks and ledges.

Fuca Pillar 0.2 mile south of the western point of Cape Flattery, is a rocky column 157 feet high and 60 feet in diameter, leaning slightly northwestward. It is 150 yards off the face of the cliff, and is more prominent from northward than from southward.

Cape Flattery, a bold, rocky head with cliffs 120 feet high, rises to nearly 1,500 feet about 2 miles back from the beach. From southward it looks like an island because of the low land in the valley of Waatch River. Numerous rocks and reefs border the cliffs eastward and southward of the cape. Tide rips are particularly heavy off Cape Flattery.

Tatoosh Island, 0.4 mile northwestward of Cape Flattery, is about 0.2 mile in diameter, 108 feet high, flat-topped, and bare. It is the largest of the group of rocks and reefs making out 0.4 mile westward. The passage between Tatoosh Island and the cape is dangerous, and constricted by two rocks awash near its center. Although sometimes used by local small craft, it cannot be recommended. The currents are strong and treacherous.

Cape Flattery Light (48°23.5′ N., 124°44.1′ W.), 165 feet above the water, is shown from a 65-foot white conical tower on a gray sandstone dwelling on the western end of a Tatoosh Island. A radiobeacon and fog signal are at the station. Telegraphic communications are available for reporting vessels or sending messages.

A rocky patch, covered 7½ fathoms, on which the sea breaks occasionally in a westerly swell, is 1.4 miles southwesterly of the light.

Duncan Rock and **Duntze Rock,** the two principal dangers north-northwestward of Tatoosh Island, lie, respectively, 1 mile and 1.3 miles from the light. Duncan Rock is small, low, and black; Duntze Rock is covered 3¼ fathoms. A lighted whistle buoy is 0.2 mile northwestward of Duntze Rock. Ledges and rocks constrict the passage between Duncan Rock and Tatoosh Island to less than 0.5 mile, and strong currents and tide rips make it hazardous.

Chart 6102.—Swiftsure Bank, about 3.5 miles in extent, lies off the mouth of the Strait of Juan de Fuca, northwestward of the submarine valley making into the strait. The bank has a least depth of 19 fathoms.

Danger area.—The Royal Canadian Navy has established a firing and practice area about 10 miles west-southwestward of Swiftsure Bank.

Carmanah Point to Amphitrite Point, Canada.—The coast from Carmanah Point to Cape Beale is very dangerous and, except during fine weather and offshore winds, should be given a wide berth.

Carmanah Point is on the Vancouver Island shore, 13 miles northward of Tatoosh Island. A light, 175 feet above the water, is shown from a white octagonal concrete tower on the point; a fog signal and radiobeacon are at the light.

Clo-oose, a small village and mission, is 5.5 miles westward of Carmanah Point in the small cove at the mouth of the Cheewhat River, eastward of the entrance to Nitinat Lake.

A reef 0.8 mile long in a northwesterly direction, with a rock awash in its center, is off this cove. It is marked by a lighted whistle buoy 0.8 mile southwestward of the rock.

Tsusiat Lake is 8.5 miles northwestward of Carmanah Light. At the seaward end of the lake is a conspicuous waterfall which is visible far off even in hazy weather, and may help fix a vessel's position as it is the only waterfall on this part of the coast. Behind Tsusiat Lake the mountains rise to more than 2,000 feet.

Pachena Point, 25 miles northwestward of Cape Flattery, is marked by a light; a fog signal is at the station.

Seabird Rocks are off the entrance to Pachena Bay, 3 miles northwestward of Pachena Point. The largest is about 48 feet high, bare, and of small extent. There is no safe passage between Seabird Rocks and the shores northeastward, and the rocks should not be approached closer than 1.5 miles.

Cape Beale is a bold rocky point, 120 feet high. A reef with rocks above and below water extends about 0.8 mile southwestward from it. A light, 170 feet above the water, is shown from a black, square skeleton tower near the western extremity of the cape; a fog signal is at the station.

Barkley Sound, an extensive arm of the sea 31 miles northwestward of Cape Flattery, lies between Cape Beale and Amphitrite Point. It is 15 miles wide at its entrance, and though encumbered by numerous islands and rocks, it maintains a breadth of 13 miles for 8 miles inland, above which it separates into several narrow inlets. The shores are low, except in the northern part and among the inlets, where they become high, rugged, and mountainous.

In the western part of the sound are innumerable rocks and islands with navigable channels between them. Entrance should not be attempted without local knowledge or a pilot. **Imperial Eagle Channel** is the easiest of access.

Amphitrite Point is the western entrance point of Barkley Sound. A light, 58 feet above water, is shown from a white rectangular building with a rounded front on the end of the point; a radiobeacon and fog signal are at the station. A whistle buoy is 1,050 yards southward of the point.

A more detailed description of Canadian waters is given in H. O. Publication No. 10, Sailing Directions for

British Columbia, published by U.S. Naval Oceanographic Office, and British Columbia Pilot, Volume I, published by Canadian Hydrographic Service.

Routes.—In clear weather no difficulty will be experienced in approaching the entrance to the Strait of Juan de Fuca from any direction, as the land on both sides is high and Cape Flattery is readily distinguished, particularly from southward, owing to the low land between Mukkaw and Neah Bays. Lights, fog signals, and radiobeacons are available on both sides of the strait to assist in obtaining a fix.

In thick weather soundings will assist in estimating the distance from shore. Vessels should pick up the 100 fathom curve and be guided by the soundings. The relationship between the 100- and 50-fathom curves is a good indication for fixing the position; vessels should not proceed inside the 50-fathom curve until a fix has been obtained. The mountain peaks in the interior sometimes can be seen when the coast is obscured by fog.

Depths.—The depths in the approaches to the Strait of Juan de Fuca are very irregular, especially outside the 50-fathom curve. There is a deep submarine valley with depths of over 100 fathoms and a width of 2 to 4 miles, between the 100-fathom curves, which leads from about 37 miles south-southwestward of Cape Flattery, rounds this cape at a distance of 2 miles, and extends about 32 miles into the strait. The 100-fathom curve on the western side of this submarine valley is very irregular, but on the eastern side it is more regular. Within the strait the curve is regular on both sides of the valley.

Currents.—The currents on Swiftsure Bank and at Umatilla Reef Lightship are described in the Tidal Current Tables. Off the entrance of the Strait of Juan de Fuca the coastal current is influenced by the flow into and out of the strait. On the flood there is a set into all the sounds on the Vancouver Island shore, and this, combined with the prevailing northwesterly current and light southerly winds, with possibly some swell from the same direction, makes the coast in the vicinity and westward of Carmanah Light dangerous, especially for small vessels. Many strandings have occurred on the Vancouver Island shore.

The flood current entering the Strait of Juan de Fuca sets with considerable velocity over Duncan and Duntze Rocks, but instead of running in the direction of the channel there is a continued set toward the Vancouver Island shore, which is experienced as far as Race Rocks. The flood current also has more velocity on the northern shore of the strait than on the southern.

The ebb current is felt most along the southern shore of the strait, and between New Dungeness Light and Crescent Bay there is a decided set southward and westward, especially during large tides. With wind and swell against the current, a short choppy sea is raised near the entrance to the strait. For additional information on currents in the Strait of Juan de Fuca, see Chapter 12.

Sailing craft approaching the strait should keep well off the mainland coast southward of Cape Flattery, unless working to windward against a fine northerly wind, which is frequently found during the summer. In this case the coast may be approached to within 3 miles. At other times there is no inducement to hug the coast, on which a long rolling swell frequently sets, and this swell, meeting the southeasterly gales of winter, causes a confused sea. The cape and its offlying dangers should be given a berth of at least 3 miles, as the tidal current sometimes sets with great velocity toward Duncan and Duntze Rocks. It is equally necessary when entering or leaving the strait to avoid the coast of Vancouver Island between Port San Juan and Bonilla Point, when there is any appearance of bad weather.

Sailing vessels making the strait during the winter, especially during November and December, and experiencing the easterly and southeasterly winds prevalent at that season, should endeavor to hold a position southward or southwestward of Cape Flattery, and should on no account open the entrance of the strait until an opportunity offers of getting well inside. It is also important to remember that, though it may be blowing strongly from the southward or south-southwestward outside, on rounding Cape Flattery, an easterly wind may be found blowing out of the strait, and a vessel would then find the Vancouver Island coast a dangerous lee shore.

Coming from the westward with a heavy westerly or northwesterly gale and thick weather, vessels uncertain of their positions should lie-to on soundings at not less than 30 miles from the entrance or on the edge of the bank. These gales seldom last more than 12 hours, and if they veer toward the southwest the weather will clear and vessels may bear up for the strait.

Fog.—The fog is generally heavier near the entrance, decreasing in density and frequency up the strait. Near the entrance the fog sometimes stands like a wall, and vessels entering the strait run out of it into clear bright weather, even before passing Tatoosh Island. The fog frequently extends a long distance seaward and, when combined with the smoke from forest fires, becomes exceptionally dense. The wind gradually works the fog into the strait, and it will follow the northern shore past Port San Juan to the Sombrio River; occasionally it will reach as far as Sooke Inlet and at times to Race Rocks. As a rule, however, the fog moves farther into the strait along the southern shore, at times reaching Port Townsend; frequently the northern shore is clear when the southern shore is enveloped in fog.

During the spring, fog is frequent in the strait. With the westerly wind it often stops at the headland between Crescent and Freshwater Bays, the fog then extending westward while it is clear to eastward. When fog extends past Freshwater Bay the small area about the western bight will often be clear.

Weather.—In summer, the prevailing northwesterly winds draw into the strait, increasing toward evening and at times blowing a 10-knot breeze before midnight. This occurs, however, only when the winds are strong outside. In light winds, sailing vessels may be a week from Cape Flattery to Admiralty Inlet, and vice versa.

In winter, southeasterly winds draw out of the strait, causing a confused cross-sea off the entrance, the heavy southwesterly swell meeting that coming out. Under

these conditions outbound vessels, especially sail, often make Neah or Clallam Bays and await more favorable weather. The weather off the entrance as a rule is exceptionaly severe, and wrecks are of frequent occurrence. The heavy broken seas are probably due to the shoaling off the entrance, the irregularity and velocity of the currents, and the conflict between the wind drawing out of the strait and that along the outer coast.

The rainfall in the vicinity of the entrance is considerable, even during the summer, although the heaviest rains occur between December and March.

12. STRAITS OF JUAN DE FUCA AND GEORGIA, WASHINGTON

Chart 6300.—Strait of Juan de Fuca separates the southern shore of Vancouver Island, Canada, from the northern coast of the State of Washington. The entrance to the strait lies between parallels 48°23′ N. and 48°36′ N., on the meridian of 124°45′ W. This important body of water is the connecting channel between the ocean and the inter-island passages extending southward to Pudget Sound and northward to the inland waters of British Columbia and southeastern Alaska.

The commerce of this region is extensive, both foreign and domestic. Vast quantities of lumber and fish, grain, and general merchandise are exported, while the manufacturing and shipbuilding industries are important. Several transcontinental railroads have their western terminals on Puget Sound and the Strait of Georgia. There are many steamer lines, foreign and domestic, operating from this area to places across the Pacific or through the Panama Canal, in addition to the coastal vessels.

At its entrance and for 50 miles eastward to Race Rocks, the strait has a width of about 12 miles, and thence it has a width of about 16 miles for 30 miles eastward to Whidbey Island, its eastern boundary. The waters as a rule are deep until near the shore with few outlying dangers, most of which are in the eastern part. The shores on both sides are heavily wooded, rising rapidly to elevations of considerable height, and except in a few places, are bold and rugged.

The northern shore should be avoided as it is the lee shore for most gales and, with the exception of Esquimalt Harbor, there are no anchorages for strangers that afford shelter from all winds.

The navigation of these waters is relatively simple in clear weather. The aids to navigation are numerous. In thick weather, because of strong and irregular currents, extreme caution and vigilance must be exercised. Strangers should take a pilot.

Boundary lines of inland waters.—The line established for the Strait of Juan de Fuca is described in **82.120,** Chapter 2.

Routes.—Vessels bound for ports in Puget Sound can proceed by rhumb lines through the following positions:

48°26′ N., 124°47′ W. (from southward).
48°31′ N., 125°00′ W. (from westward).
48°16′ N., 123°31′ W.
48°10′ N., 122°45′ W.

A midchannel course can be followed through Admiralty Inlet and Puget Sound to Seattle.

Currents, Cape Flattery to Race Rocks.—The currents may attain velocities of 2 to 4 knots, varying with the range of tide, and are influenced by strong winds. Eastward of Race Rocks, in the wider portion of the strait, the velocity is considerably less. At Race Rocks and Discovery Island the velocity may be 6 knots or more.

The **flood current** entering the Strait of Juan de Fuca sets with considerable velocity over Duncan and Duntze Rocks, but instead of running in the direction of the channel, there is a continued set toward the Vancouver Island shore which is experienced as far as Race Rocks. The flood current velocity is greater on the northern shore of the strait than on the southern.

The **ebb current** is felt most along the southern shore of the strait, and between New Dungeness Light and Crescent Bay there is a decided set southward and westward, especially during large tides. With the wind and swell against the current, a short choppy sea is raised near the entrance to the strait.

The current movement is complicated by a large daily inequality. The Tidal Current Tables should be consulted for times and velocities.

Tide rips occur off the prominent points and in the vicinity of the banks. These are particularly heavy off Cape Flattery, Race Rocks, Dungeness Spit, and Point Wilson, at times becoming dangerous to small vessels.

Pilotage.—All vessels are subject to pilotage eastward of Port Angeles, inside the international boundary line extending southward to and including Olympia, except vessels under enrollment and vessels engaged exclusively in the coasting trade. Port Angeles has been designated as the pilotage station for all vessels en route to or from the sea. Pilots may be obtained at Port Angeles, or upon request, at the Puget Sound Pilots office, Seattle.

Vessels desiring a pilot should proceed to a point 500 yards east of Ediz Hook, where the pilot will board the vessel. Should a northwest wind, sea, and swell exist, vessels should proceed to a position inside and south of Ediz Hook, so as to provide a lee and facilitate boarding. In clear weather vessels should indicate their desire for a pilot by hoisting the International Code flag **"G"** and blow the whistle signal of one long, one short, and one long. In fog or thick weather the blowing of this signal will attract the attention of the pilot station, and repetition of the signal will assist the pilot boat in locating the vessel.

The pilot station is located nearly 0.7 mile west of Ediz Hook Light. At night the station will show from a mast three vertical lights, the highest and lowest of which will be red and the middle one green, to indicate that the pilot boat is en route to the vessel. The pilot station is equipped with radar to locate and track vessels and to direct the pilot to ships via radiotelephone during periods of low visibility.

In an emergency, vessels equipped with radiotelephone

may call the Coast Guard station on Ediz Hook, call letters NOW, 2182 kc., which will relay the message to the pilot station.

In British Columbia, pilots may be obtained on application at Vancouver or Victoria. A boarding station has been established within a radius of 7 miles of Race Rocks.

Tugboats will be found at Port Angeles and can be had by signaling the Cape Flattery Light station.

Quarantine.—Vessels subject to quarantine usually proceed to their docks where they are boarded for inspection.

Strait of Juan de Fuca, northern shore (Canada).—Carmanah Point is described in the previous chapter. **Bonilla Point,** the northern entrance point at the western end of the strait, is about 1.8 miles east-southeastward from Carmanah Light. Inland of Bonilla Point, which slopes gradually to the sea, the mountains attain heights up to 3,515 feet and are heavily wooded. A reef extends 0.5 mile off the point and the shores should be given a berth of at least 1.5 miles.

From Bonilla Point the coast trends in an easterly direction for 9.5 miles to Owen Point. It is nearly straight, rocky, and bluff, with high mountains rising immediately behind it; all are heavily wooded.

Port San Juan offers the first anchorage on the northern shore within the entrance to the Strait of Juan de Fuca. The port is conspicuous from seaward, appearing as a deep gap between two mountain ranges.

The entrance between **Owen Point** and **San Juan Point,** 2 miles wide and 3.5 miles long, is 13 miles northeastward of Cape Flattery Light. It is marked by a lighted whistle buoy.

The port is open to southwesterly winds, and a heavy sea rolls in when a moderate gale is blowing from that direction. Though it is possible that a vessel with good ground tackle could ride out a gale if anchored in the most sheltered part, it is recommended that with any indication of southwesterly gales a vessel should weigh anchor immediately, and if outward bound seek shelter in Neah Bay.

Anchorage may be had in 6 to 9 fathoms anywhere in Port San Juan; a good position is in 5½ fathoms about 1 mile from the beach at the head of the port.

Cerantes Rocks, about 300 yards southwestward from San Juan Point, include several high pinnacle rocks with a few trees growing on them. About 800 yards northward of these rocks and 300 yards from shore is another reef partly uncovered.

Port Renfrew is a settlement on the southeastern side of Port San Juan, about 2 miles northeastward of San Juan Point. A T-head pier, marked by a light, has a depth alongside of 18 feet.

From Port San Juan the coast trends eastward for 23.5 miles to Sheringham Point. This stretch of coast presents no prominent features. The country is thickly wooded and the land rises to a considerable elevation. The points, some of which are bare on their extremities, are not prominent nor are they easily identified, except from close inshore.

Between Port San Juan and Race Rocks, fish traps and broken piles are reported to extend 0.5 mile offshore in places.

Chart 6382.—Sheringham Point is marked by a light. A fog signal is at a white square building close southward of the light.

From Sheringham Point the coast continues in a series of bays and inlets for 16.5 miles to Race Rocks.

Beechey Head, 11.5 miles east-southeastward of Sheringham Point, is bold, wooded, and steep-to. Vessels bound up the strait and passing outside Race Rocks should give Beechey Head a berth of 2 miles.

Race Rocks, 5 miles eastward of Beechey Head, are a cluster of bare low rocks from 0.5 mile to almost 1.5 miles from shore. Foul ground extends for 0.5 mile in all directions from the light; dangerous overfalls and races occur during bad weather. A light, fog signal, and radiobeacon are on the largest rock of the group.

Foul ground, due to dumping of heavy steel wire mesh material, exists 3.2 miles west by south from Race Point Light.

Eastward of Race Rocks the Strait of Juan de Fuca expands to a width of about 16 miles, and extends for 30 miles east-northeastward to the entrance to Admiralty Inlet on the south, and Rosario Strait on the north.

A 25-fathom bank lies 8.5 miles southeastward of Race Rocks along the steamer track from Race Rocks Light to Point Wilson Light. The western edge of this bank is sometimes sharply defined by a line of ripples with glassy calm water to the eastward.

Bentinck Island, 1 mile northwestward of Race Rocks Light, is fringed with kelp on its southern and eastern sides. **Pedder Bay, Parry Bay,** and **Royal Roads,** separated by William Head and **Albert Head,** form the coast between Bentinck Island and the western entrance to Esquimalt Harbor.

A **prohibited area** has been established in Parry Bay by the Canadian Government. No vessel may anchor in the area without permission.

A **measured nautical mile,** on a 027°43′ course, is in Parry Bay. The northeastern marker is located on **Goat Islet,** southwestward of Albert Head. Mariners are warned to keep clear of any vessel running full power trials in this area.

William Head is a comparatively low promontory extending about 0.5 mile northeastward of **Ned Point.** It is marked by a light and fog signal. The southeastern side of this promontory is foul for a distance of about 200 yards offshore.

The quarantine station for Victoria and other ports is on William Head. All vessels from foreign ports are required to contact this station, where they may be granted permission to proceed to their docks for inspection. Vessels should notify the quarantine station by radio of their expected time of arrival. Reciprocal quarantine inspection has been arranged between Canada and the United States; vessels from foreign ports destined for both Canadian and United States ports shall undergo

inspection at the primary port of arrival, such inspection ordinarily being sufficient for entry at the port of the other Government.

Anchorage may be had in 7 fathoms about 0.5 mile northward of William Head and about 1,200 yards from the mainland.

Constance Bank, 6.8 miles eastward of William Head Light, has general depths of 9 to 13 fathoms. It is about 2 miles long and 1 mile wide, within the 20-fathom curve. The bottom is rocky and tide rips are formed in this vicinity. Vessels should not attempt to anchor on the bank.

Albert Head, 3.3 miles northeastward of William Head, is marked by a light and fog signal. **Fisgard Island,** on the western side of the entrance to Esquimalt Harbor, is marked by a light. Its red sector covers **Scroggs Rocks** off the eastern entrance point.

Chart 6380.—Esquimalt Harbor affords safe and ample anchorage, and can be entered at any time. The entrance channel has general depths of 8 fathoms. Depths within the entrance gradually decrease for 1.5 miles northward to **Cole Island,** above which the head of the harbor dries.

Victoria Harbor, which is landlocked and well protected, is about 2 miles east-southeastward of Esquimalt Harbor, and can accommodate the largest vessels. A U.S. Immigration station is in Victoria.

Victoria Harbor is entered between **Macaulay Point** on the west, and the breakwater extending from **Ogden Point** on the east; the breakwater is marked by a light. Vessels requiring a pilot are requested to notify "Pilots Victoria" by radio station **VAK** at least 6 hours in advance of their estimated time of arrival. The harbor extends for more than 0.5 mile northward to **Shoal Point** on the eastern side, and thence trends eastward to **James Bay.** From the northern part of James Bay, the upper harbor, which is crossed by three bridges, extends about 0.8 mile north-northwestward to **Selkirk Water,** the western extremity of which is connected to **Portage Inlet.**

Brotchie Ledge, the only outlying danger, about 200 yards in extent within the 5-fathom curve, lies 0.6 mile southward of Ogden Point. The ledge has a least depth of 12 feet, and is marked by a light and fog signal.

Clover Point, 2 miles east-southeastward of the entrance to Victoria Harbor, is low, bare of trees, and steep-to. Strong tide rips are formed off the point.

Trial Islands, 4 miles eastward of Victoria Harbor, are bare and rocky; from most directions the two islands appear as one. The islands are marked by a light and fog signal. The southern and larger island is 80 feet high, and from **Ripple Point,** its southern extremity, a rocky ledge which uncovers 2 feet extends about 100 yards. Severe tide rips are formed off Ripple Point, especially on the flood tidal current, which attains a velocity of 3 to 6 knots during large tides. The point should be given a wide berth.

Discovery Island, 2 miles east-northeastward of **Gonzales Point,** lies off the junction of Haro Strait and the Strait of Juan de Fuca. The island is wooded, and near its southeastern tip, **Pandora Hill** attains a height of about 125 feet. The island is marked by a light and fog signal. On all sides of the island the shores are fringed with rocks in some places extending as far as 600 yards offshore.

Strait of Juan de Fuca, east end.—Hein Bank, with a least depth of 2¼ fathoms, lies 8.5 miles southeastward of Discovery Island; it is about 2 miles long in a northerly direction, within the 10-fathom curve, and 0.8 mile wide. The shoalest part of the bank is covered with thick kelp in the summer. It is marked by a lighted bell buoy.

A **danger zone** of a Naval operations area is in the vicinity of Hein Bank; see **204.221,** Chapter 2, for limits and regulations.

Smith Island, 5 miles westward of Whidbey Island and 8 miles east-southeastward of Hein Bank, is irregular in shape and about 0.5 mile in extent. The eastern end is low, but rises abruptly to an elevation of 55 feet at its western end, terminating in a white perpendicular cliff composed of sand and gravel. Kelp extends about 1.5 miles westward of the island, with a width of about 1.5 miles over depths of 4 to 6 fathoms; a rock covered by 3½ fathoms lies about 1.8 miles westward of the light. A rock that bares at lowest tides is about 0.3 mile westerly of the light. Strong currents set in and around the shoal area, especially on the flood, and deep-draft vessels should keep well outside the 10-fathom curve to avoid being set into danger. **Smith Island Light (48°19.1′ N., 122°50.6′ W.),** 97 feet above the water, is shown from a skeleton tower with a white square daymark near the western extremity of the island; a radiobeacon is at the station.

Minor Island, small, low, and rocky, lies 1 mile northeastward of Smith Island, and at lowest tide is connected with it by a gravel and boulder spit. A light and fog signal are on the island.

The northern part of **Whidbey Island** forms the eastern side of the Strait of Juan de Fuca. This part of the island has uniformly sandy shore backed by low and rolling upland of farm and wooded areas.

The aero light **(48°20.9′ N., 122°40.2′ W.),** at Ault Field is conspicuous.

Charts 6265, 6266.—On the south side of the Strait of Juan de Fuca the coast trends east-northeastward for 4 miles from Cape Flattery to **Koitlah Point,** the western point at the entrance to Neah Bay. The shores are rugged and the country is heavily timbered.

Neah Bay, 5 miles eastward of Cape Flattery, is used extensively by small vessels as a harbor of refuge in foul weather. Its proximity to Cape Flattery and ease of access at any time makes this anchorage very useful.

A rubblestone breakwater extends from the western side of the bay to about the middle of Waada Island. Anchorage is in 4 to 6 fathoms, sandy bottom. **Waada Island,** 0.5 mile long, forms the northeastern side of the bay; it is 0.3 mile northward of Baada Point and is high and wooded, with a reef and foul ground extending 0.2 mile from its southwestern side. A wharf is on the south-

western side of the island just southward of the foul ground. A light and fog signal are at each end of the island.

The western shore of Neah Bay is high and precipitous, and bordered by craggy rock outcroppings. Eastward of the village, the shore is a low sand beach to Baada Point. The entrance to the bay is between Waada Island and Baada Point. Controlling depth through the entrance is about 16 feet.

A reef that bares, marked by a lighted bell buoy, extends 500 yards northwestward from **Dtokoah Point,** southeast of the entrance. **Baada Point** is rocky and grass-covered for some distance back from the shore. The buildings of the Coast Guard station, 0.4 mile southwestward of the point, are the prominent features on the point. A T-head pier, 470 feet long, is 500 feet eastward of the Coast Guard launching ways. Several small white houses are between the pier and the point. See Appendix for **storm warning display.**

The Indian village of **Neah Bay,** on the southwestern shore of the bay, is the site of considerable sport fishing and logging. Logs are trucked to a boom on the breakwater, 900 yards from the westerly end, where rafts are made up.

A cooperative fish wharf, built out to 18 feet from the middle of the south shore of the bay, has facilities for icing and supplying fishing boats. About 300 yards westward is another fish wharf, extending out to 18 feet.

If needed, pilots or tugboats may be engaged at Port Angeles. Neah Bay is a Customs port of entry. Fresh water, gasoline, diesel oil, and groceries are available in limited quantities.

Telephone service is available to Tatoosh Island, via Coast Guard lines, in emergencies only.

Chart 6300.—From Neah Bay to Clallam Bay, the coast for more than 14 miles is rugged and the back country high and heavily wooded.

Seal Rock and **Sail Rock,** some 2 miles east of Neah Bay and about 600 yards offshore, are very prominent. Seal Rock, the westerly one, is 100 feet high with a flat top sloping eastward; it is light in color. Sail Rock, 0.2 miles east of Seal Rock, is lower and more pointed. Covered rocks extend from Seal Rock to shore, and there are patches of kelp in this area.

The wreck of the steamer ANDALUCIA is just off Seal Rock and Sail Rock. Only the stack is now visible. Kelp and some rocks extend over 400 yards off a point 5 miles eastward from Seal Rock. **Sail River** empties near Seal and Sail Rocks. **Sekiu River,** about 6.5 miles eastward, has some logging operations. The railroad trestle over the river shows prominently through the trees.

Clallam Bay, about 15 miles eastward of Neah Bay, is a broad and open bight about 2 miles long and 1 mile wide. It affords anchorage in 9 to 10 fathoms, sandy bottom, and is used to some extent in southerly or thick weather.

Slip Point, the eastern point of the bight, is high and wood; there is a light-colored streak like a landslip down its face, which is visible for a long distance. A reef, extending 0.2 mile westward of the point, is marked by a bell buoy. **Slip Point Light (48°15.9′ N., 124°14.9′ W.),** 55 feet above the water, is shown from a 64-foot white square tower on a pile structure on the western extremity of the point; a fog signal is at the station.

Sekiu is a town on the western end of Clallam Bay and southward of Sekiu Point. The logging company's tugs, tankers, and steamers call occasionally; there is no regular freight service by water. The logging wharf has a depth of 15 feet. Log rafts are made up here for shipment. **Clallam Bay** is a small town on the eastern side of Clallam Bay.

In entering Clallam Bay, give Slip Point a berth of not less than 0.2 mile to avoid the reef projecting westward of it. Storm-bound vessels generally anchor abreast the rocky point near the middle of the long semicircular beach on the southern shore of the bay.

Pillar Point, 6.7 miles east-southeastward of Slip Point, is bold, 700 feet high, wooded up to its summit, with a dark pillar-shaped rock more than 100 feet high lying close under its eastern face. The rock shows prominently from westward. Good anchorage may be had in 9 to 12 fathoms, sticky bottom, about 0.8 mile southeastward of Pillar Point. This anchorage offers good shelter from the heavy westerly swell but gives no protection from the brisk easterly and northeasterly winds which prevail in winter.

Chart 6382.—Twin Rivers, 7 miles eastward of Pillar Point, is a small cove protected by shoal spits on either side, upon which the sea breaks in rough weather. There are depths of 4 fathoms abreast the ends of the spits, and 2 fathoms can be carried close to shore. The cove is an excellent landing place, but offers little protection as an anchorage.

Shoal water makes out a considerable distance from **Low Point,** 5 miles east of Twin Rivers, and vessels should not approach this point closer than 0.8 mile. Westward of the point, there are many boulders that uncover.

Agate Bay, 3.5 miles eastward of Low Point, is clear and deep; 10 fathoms can be carried to within 0.2 mile of the shore.

Crescent Bay, 15 miles eastward of Pillar Point, is a small semicircular bight 1 mile in diameter. The eastern part is shoal and near the western shore the remains of a wharf should be avoided. This is not a good landing place in northerly weather. The anchorage is of limited extent and suitable only for small vessels.

Crescent Rock, covered by ¼ fathom, is 0.4 mile northward of the western entrance point of Crescent Bay. It extends 0.4 mile in an easterly direction, with a narrow channel between it and the point. The channel, with a reported depth of 10 fathoms, is not recommended for those without local knowledge. The rock is marked by a lighted bell buoy. A reef extends about 400 yards northwestward from **Tongue Point,** the eastern entrance point of Crescent Bay. A shoal, covered 1¼ fathoms, lies about 0.3 mile westward of Tongue Point. A wreck lies off the entrance about 0.3 mile north of Tongue Point.

Observatory Point is 3 miles eastward of Tongue Point

Between these points is a wooded ridge which, because of the lower land behind it, makes this area appear as an island when raised from eastward or westward. The ridge attains an elevation of 1,135 feet. On its north face is a conspicuous landslide; the hill is known as **Striped Peak.** A rock, 20 feet high, lies close off Observatory Point; the rock and the point are almost joined at low water.

Freshwater Bay, about 4 miles eastward of Crescent Bay, is a broad open bight, affording anchorage in 6 to 10 fathoms. The bay and adjacent waters are designated as an **emergency explosives anchorage;** limits and regulations are given in **202.230,** Chapter 2.

Angeles Point, on the eastern side of Freshwater Bay, is low, sandy, and covered with alders. The **Elwha River** empties into the strait at this point.

Chart 6303.—Port Angeles, 6.5 miles eastward of Freshwater Bay and 56 miles from Cape Flattery, is entered between **Ediz Hook,** a low, narrow and bare sandspit 3 miles long, and the main shore to the southward. The harbor, about 2.5 miles long, is easy of access by the largest vessels which frequently use it when awaiting orders or a tug, or are weatherbound.

The harbor is protected from all except easterly winds which occasionally blow during the winter. During southeasterly winter gales, the wind is not usually felt but some swells roll in. The depths are greatest on the northern shore, and decrease from 30 to 15 fathoms in the middle of the harbor; from the middle, the depths decrease regularly to the southern shore, where the 3-fathom curve in some places in the eastern part is nearly 0.2 mile from the beach. A depth of 25 feet is off the southeasternmost dock. The best anchorage is off the wharves, in 7 to 12 fathoms, sticky bottom.

Ediz Hook Light (48°08.4′ N., 123°24.5′ W.), 85 feet above the water, is shown from the top of the Port Angeles Air Station control tower, 0.3 mile westward of the eastern extremity of Ediz Hook. A radiobeacon and fog signal are near the eastern end of the point, and a lighted bell buoy is off the point.

Port Angeles is on the southern shore of the harbor. Lumber, logs, pulpwood, and plywood constitute the greater part of the traffic, and considerable oil is brought in by tankers.

A shoal with a least depth of 3 fathoms lies 350 yards northwestward of the northwest corner of the Rayonier, Inc., wharf which projects from the southern shore eastward of the town. A buoy is 225 yards off the north end of the wharf.

There is a small-craft harbor just westward of the Port Angeles wharf, in the southwestern part of the bay. Protection is afforded by timber bulkheads and spoil fill. Depths inside are 12 to 14 feet.

See Appendix for **storm warning display.**

Pilotage.—Pilots for Puget Sound may be had at Port Angeles. Pilots for Alaska may be had there by prior arrangement. The Pilot Station is nearly 0.7 mile westward from Ediz Hook Light. A dock for moorage of the pilot boat is on the south side of Ediz Hook, adjacent to the pilot station.

Detailed instructions for obtaining a pilot are given earlier in this chapter.

Towage.—Small tugboats are always available, and others can be obtained on short notice.

Quarantine.—Vessels subject to quarantine usually proceed to their docks for inspection. Vessels from foreign ports which expect to enter both Canadian and U.S. ports may receive their inspection either at William Head, Canada, or at a U.S. port; no further inspection being required. Quarantine officers when needed are sent from Seattle.

Customs.—Port Angeles is a port of entry, and marine documents are issued.

Immigration officials are stationed at Port Angeles.

Harbor regulations.—The port of **Port Angeles Commission** office is at the port docks. Copies of the harbor regulations may be obtained from the harbormaster of the city of Port Angeles.

Wharves.—There is one wharf for general cargo, one for gravel, and one for fuel. The port of Port Angeles maintains a 650-foot wharf with a face 150 feet wide; depths alongside are 30 feet. The wharf is equipped with transit sheds and modern loading facilities. There is a large crane on the wharf which is used occasionally to lift out small fishing craft of 10 to 12 tons, for repairs. The sawmills and forest products companies have their own exporting wharves with depths ranging from 24 to 34 feet.

Supplies.—Water, groceries, and marine hardware are available. There are several oil company facilities where gasoline, fuel oils, and other petroleum products may be obtained.

Repairs.—Port Angeles has no drydocks, but there are two marine railways here with maximum hauling capacity of 50 tons each. Minor repairs to hulls and machinery may be made at several machine shops and iron works in the city; shafts up to 30 feet in length can be machined.

Port Angeles is the U.S. terminal of two ferry systems operating to Victoria and other Canadian ports.

Chart 6382.—From Port Angeles the coast trends eastward for 13 miles to the end of **Dungeness Spit,** which encloses **Dungeness Bay.** This bay affords shelter in westerly winds, but is open eastward, and in northerly weather the protection afforded is only fair. It is a dangerous place in winter gales, especially from the southeast. The bay is formed by a sandspit extending northeastward 4 miles and forming, in addition to Dungeness Bay, a small lagoon at the head of the harbor which can be entered by light-draft vessels with local knowledge.

New Dungeness Light (48°10.9′ N., 123°06.6′ W.), 67 feet above the water, is shown from a 63-foot conical tower on a dwelling on the outer end of the spit. A radiobeacon and fog signal are at the station. See Appendix for **storm warning display.**

From the end of the spit a shoal extends northeastward for 0.8 mile from the light. This has been reported as

extending farther northward and it should be passed with caution. A buoy marks the shoal; vessels should not pass between the buoy and the light. From the southern side of the bay a shoal makes out about a mile.

The best anchorage is in 5 to 9 fathoms, sticky bottom, a mile southward of the light.

Dungeness is a small town on the southern shore of the bay. Farm produce is the principal shipment. The ruins of a former wharf extend about 1,000 yards out across the flats.

Chart 6403.—Sequim Bay, 6 miles southeast of Dungeness Bay, is a landlocked bay 3.8 miles long. From the eastern entrance point a sandspit extends westward almost to the western shore and terminates in **Kiapot Point,** leaving only a narrow, winding channel through which 11 feet can be taken with local knowledge. Northward of this point a shoal extends about 800 yards eastward from the western shore, and southward of the point a bar extends across the fairway. Once inside there is good anchorage anywhere in 6 to 20 fathoms, muddy bottom. The harbor is seldom used and should be approached only by those with local knowledge. A cannery with conspicuous white buildings is on the western side of the entrance to the harbor abreast the sandspit. A wharf with an incline leading to a clam-shipping plant is on the east side of the bay. Some log rafts are made up in the bay. **Sequim Bay State Park** is at the southwestern end of the bay.

Protection Island is a prominent feature in approaching Port Discovery. The island, 200 feet high near its western extremity, is 1.5 miles long; it is sparsely wooded, and the northern shore consists of bare, light bluffs. The eastern end and southern shore are clear of dangers, but off **Kanem Point,** its southwestern end, a shoal extends southwestward for over 0.2 mile, and depths of 5 fathoms and less are found 0.5 mile westward of the point. This shoal is marked by a buoy. **Dallas Bank** extends northward from Protection Island; the 10-fathom curve lies about 2.5 miles from the northern point. Northward of the 10-fathom curve the bank drops off abruptly to depths of over 20 fathoms.

Port Discovery is 2 miles south-southeastward of Protection Island. George Vancouver, the English explorer, anchored and refitted his ships here for his exploration of these regions in 1792. The bay trends in a southeasterly direction for about 8 miles. The entrance is masked from seaward by Protection Island, which protects it from northwesterly winds. There are no outlying dangers, and the depths are great.

Diamond Point is the western point at the entrance to Port Discovery. A wharf in ruins is just inside the point.

The shore from **Cape George,** the eastern entrance point of Port Discovery, for 3 miles to **Middle Point,** consists of high, bare, clay bluffs, sparsely wooded on top, attaining a height of 400 feet near the northeasterly end. A shoal covered 2 fathoms extends 0.6 mile northwestward of Middle Point; it is marked by a buoy. Vessels are cautioned not to pass between the buoy and the point.

Chart 6450.—From Middle Point the shore trends northeastward for 3.5 miles to **Point Wilson,** the western point at the entrance to Admiralty Inlet, and consists of high, bare, clay bluffs, sparsely wooded on top, decreasing in height near Middle Point, and ending abruptly close westward of Point Wilson.

Point Wilson Light (48°08.7′ N., 122°45.2′ W.), 51 feet above the water, is shown from a 46-foot white octagonal tower on a building on the eastern extremity of the low point. A radiobeacon and fog signal are at the station.

Shoals extend 0.5 mile northwestward of Point Wilson to the 5-fathom curve over irregular bottom; these are generally indicated by kelp. The eastern edge of the shoals rises rather abruptly from deep water. Heavy tide rips extend northward of these shoals, being especially heavy with a westerly wind and ebb current. A buoy marking the shoals is about 0.7 mile northwestward of Point Wilson Light.

In approaching Point Wilson in thick or foggy weather, especially if the fog signal is not heard, vessels should obtain soundings constantly.

Point Partridge, the westernmost point of Whidbey Island, has a yellow face and is prominent from the northward or southward; it is rounding and not easily identified from westward. A light and fog signal are on the point. A rocky ledge extends 0.5 mile westward from the point and in summer is usually marked by kelp.

The western shore of Whidley Island, between Admiralty Head and Point Partridge, is mostly a sandy beach rising sharply to bluffs 100 to 250 feet high, backed by pine trees. The shoreline is generally strewn with logs.

A Naval **restricted area** is off the westerly shore of Whidbey Island; see **207.750,** Chapter 2, for limits and regulations.

Admiralty Head, 80 feet high, on Whidbey Island, is the eastern entrance point of Admiralty Inlet and the southeastern extremity of a succession of light bare bluffs which extend northward of Point Partridge, where they attain their highest elevation. About 0.5 mile northward of Admiralty Head an abandoned lighthouse tower 39 feet high stands on top of a bluff.

From Point Partridge the northwestern coast of Whidbey Island extends north-northeastward 11.5 miles to Deception Pass. It is free of offlying dangers, but should not be approached closer than a mile.

Partridge Bank, within the 10-fathom curve, is about 3 miles long, 1.5 miles wide, and the southeastern end reaches within 2 miles of Point Partridge. The northern and eastern sides fall off abruptly to 20 and 30 fathoms. The shoalest part, 2¼ fathoms, lies near the northern side about midway between the ends; it is marked by a buoy. A lighted bell buoy is about 0.6 mile south-southeastward of the 2¼-fathom spot. A considerable part of the bank is covered with kelp which is usually drawn under by currents. The kelp generally extends to the 7-fathom curve, except toward the eastern end where the shoal narrows, and no kelp exists beyond a depth of 4 fathoms.

Chart 6380.—The waters of **San Juan Archipelago** embrace the passages and bays northward of the eastern end of the Strait of Juan de Fuca. These passages are used extensively by vessels bound for British Columbia and Alaska ports and by local vessels.

The directions which follow are intended for use only in clear weather; in thick weather or at night strangers should take a pilot. Sailing craft should not attempt the passages against the current unless the wind is fair and fresh. The tidal currents have great velocity in places, causing heavy tide rips that are dangerous. Owing to the variable direction and velocity of the currents, compass courses are of little value, and where followed, allowance must be made for the set of the current.

Haro Strait, the westernmost of the three main channels leading from the Strait of Juan de Fuca to the southeastern end of the Strait of Georgia, is the one most generally used. Vessels bound from the westward to ports in Alaska or British Columbia should use Haro Strait, as it is the widest and is well marked. Vessels bound northward from Puget Sound may use Haro Strait, San Juan Channel, or Rosario Strait.

From off the southerly part of San Juan Island, Haro Strait extends northward for about 16 miles to Turn Point Light on Stuart Island, and then bends sharply northeastward for 11 miles to its junction with the Strait of Georgia between East Point, the eastern end of Saturna Island, Canada, and Patos Island, the small United States island, both of which are marked by lights. The width varies from 2 to 6 miles, and the depths are generally great.

No difficulty will be experienced in navigating the strait in clear weather; in thick weather strangers should take a pilot.

The eastern shore of the strait will be described in detail, with only a brief general description of the western shore. More complete detail of the western shore is contained in H.O. Pub. No. 10, Sailing Directions for British Columbia, published by the U.S. Naval Oceanographic Office, and the British Columbia Pilot, Volume I, published by the Canadian Hydrographic Service.

The International Boundary between the United States and Canada passes through Haro Strait.

Tidal currents.—In Haro Strait the flood current sets northward through the strait, and the ebb in the opposite direction. The ebb usually runs longer and has a greater velocity than the flood. At its northern entrance the flood sets eastward on both sides of Sucia Islands and eastward across Alden Bank. The velocity in the strait is 1 to 5 knots. Off Turn Point the ebb may attain a velocity of 6 knots during large tides. The current has moderate velocity between Sucia Islands and Orcas Island. There is a large daily inequality in the current; for predicted times and velocities see the Tidal Current Tables. These tables contain daily predictions for a location off Turn Point. Heavy tide rips occur on Middle Bank and northward of it and around Discovery Island. Tide rips also occur between Henry Island and Turn Point on the ebb and around Turn Point. Heavy dangerous tide rips occur between East Point and Patos Island and for 2 miles northward in the Strait of Georgia. The flood current sets eastward from Discovery Island across the southern end of Haro Strait until close to San Juan Island. This eastward set is especially noticeable during the first half of the flood.

Rocky Middle Bank, with a least depth of 11 fathoms, lies in the southern approach to Haro Strait. The bank is about 3.5 miles in extent and the least depth is in its northeastern part and 5.5 miles southwestward of Cattle Point Light on the southernmost tip of San Juan Island. In the vicinity of this bank heavy tide rips dangerous to small craft are formed in bad weather.

Two small banks, covered 7 and 8 fathoms, lie about 3.5 miles northwestward of Middle Bank. In bad weather, heavy tide rips are formed over these banks.

San Juan Island, the largest of the group, about 13 miles long, is rugged and partly wooded. **Mount Dallas,** the highest of several hills on the island, rises abruptly from the middle of the western side to a height of 1,036 feet. In most places the shores are free of outlying dangers. The northern end of the island is indented by several small bays which, with the exception of Roche Harbor, are shoal and of no commercial importance.

From **Eagle Point,** the western shore of San Juan Island trends northwestward and forms the eastern side of the southern part of Haro Strait. This shore is steep-to and rocky, and beyond 400 yards offshore it is free of danger; however, the depths off this shore are too great for anchoring.

Kanaka Bay, a small cove used by fishing boats, is 2.5 miles northwestward of Eagle Point.

Lime Kiln Light (48°31.0′ N., 123°09.1′ W.), 55 feet above water, is shown from a 38-foot white octagonal tower attached to a building on the west side of San Juan Island; a fog signal is at the light. Two dwellings are about 150 yards southeastward of the light. Rocks awash lie close inshore about 1 mile southeast by east of the light.

Local magnetic disturbance.—Differences from the normal variation of as much as 4° have been observed in the vicinity of **Bellevue Point,** 1 mile northward of Lime Kiln Light.

During the June-October fishing season, many purse seiners operate in this area. At night these vessels anchor close inshore, generally between Cattle Point and Pile Point.

Chart 6379.—Hanbury Point, 3.8 miles north of Lime Kiln Light, is the northern entrance point to **Mitchell Bay,** one of a series of well sheltered bays on the northwestern coast of the island. **Mosquito Pass,** available only to small craft with local knowledge, leads westward of Hanbury Point to **Garrison Bay** and **Westcott Bay.**

Henry Island is close westward of the northern point of San Juan Island, from which it is separated by Mosquito Pass and Roche Harbor.

Kellett Bluff, at the southern end of Henry Island, is steep and rocky and prominent from either southward or

northward. It is marked by a light and fog signal. **Open Bay**, east of Kellett Bluff, offers good holding ground and protection for small boats from northerly and easterly weather.

Roche Harbor has its main entrance between the northern end of Henry Island and the western end of **Pearl Island,** which is marked by a light. Sand spits covered 17 and 18 feet extend into the channel from the islands on each side of the entrance. The landlocked harbor has depths of 5 to 8 fathoms. It affords good anchorage and in the summer is used extensively by yachts.

The principal wharf has depths of 13 feet off its end. The nearby float moorings can accommodate 250 boats. A general store is on the wharf; gasoline and diesel oil are pumped at the dockside. A crane can hoist out boats up to 1½ tons for minor repairs; ice, water, groceries, and some supplies can be obtained.

Battleship Island, small and 30 feet high, is about 0.2 mile west-northwestward of McCracken Point, the northern extremity of Henry Island, and is the western point in the approaches to Roche Harbor.

Danger Shoal, with a least depth of 1 fathom, is in the fairway to Spieden Channel about midway between Battleship Island and Spieden Bluff. A lighted bell buoy is close southwestward of the shoal which is marked by kelp.

A rock, marked by kelp with 2 fathoms over it, is about 200 yards northwestward of **Barren Island,** 0.7 mile east of McCracken Point; it is marked by a buoy. Another rock, marked by kelp and covered 1 fathom, is about 350 yards eastward.

Spieden Channel leads eastward between Spieden Island on the north and Battleship, Henry, and San Juan Islands on the south; the channel leads from Haro Strait to President Channel and San Juan Channel. The eastern entrance, the narrowest part, is 0.6 mile wide, and for 2 miles westward of it the channel is free of danger. However, in the western entrance, which has an irregular bottom, there are several dangers but the fairway is deep throughout. The meeting of the flood currents, which flow eastward from Haro Strait and westward from San Juan Channel, causes heavy tide rips and eddies. This channel is not recommended for sailing craft.

Spieden Island lies with **Spieden Bluff,** its northwestern end, 1.6 miles north-northeastward of Battleship Island. The island is 2.5 miles long in an easterly direction with an extreme width of 0.5 mile. **Green Point,** the eastern end which is marked by a light, is low and grassy; there are few trees on the southern side of the island but the northern face is well wooded.

Southeastward of Spieden Bluff there are several dangers: **Center Reef,** which bares, 0.7 mile south of the bluff; **Sentinel Rock** and **Sentinel Island,** closer inshore, and a rock midway between them that is covered ¾ fathom.

Chart 6380.—Stuart Island, northwestward of Spieden Island, is wooded with two prominent hills 640 feet high near the middle. **Turn Point,** the western extremity, is bold and steep-to. **Turn Point Light (48°41.3′ N., 123°14.2′ W.),** 44 feet above the water, is shown from a 16-foot white tower on the end of the point; a fog signal is at the station.

Reid Harbor indents the southeastern shore of Stuart Island and trends northwestward about 1.5 miles. The harbor, which is landlocked and 400 yards wide, affords good anchorage in 4 to 4½ fathoms, soft bottom. The State Parks and Recreation Commission maintains a small-craft pier and facilities here. The harbor is free of danger, but from the eastern entrance point foul ground extends about halfway across the entrance. Enter in midchannel and anchor anywhere in the middle of the wider portion of the harbor.

Prevost Harbor, on the northern shore about 1.5 miles eastward of Turn Point, affords good shelter and anchorage. The village of **Prevost,** with 7 feet at the wharf, is on the western shore; a mail boat operates between the village and Anacortes. The State Parks and Recreation Commission maintains a float landing for small boats.

Satellite Island lies within Prevost Harbor, with reefs and shoals extending off its southeastern extremity. Vessels should not pass eastward of the island. Enter in midchannel westward of Satellite Island and anchor in 6 to 7 fathoms, muddy bottom, in the middle of the wider portion just within the entrance, keeping clear of a rock that uncovers 8 feet, 200 yards off the southern shore.

Waldron Island, 6.5 miles eastward of Turn Point Light, is steep and rocky on the eastern side, but flat with sandy beaches on the northern and western sides. It is irregular in shape and 3 miles in length. The highest point, 580 feet, is near **Point Disney,** its southern end. On the northern and eastern sides of the island there is a high yellow sand bluff, terminating abruptly in **Point Hammond.**

Cowlitz Bay, which indents the southwestern shore of Waldron Island, is a broad, open bight affording anchorage in fair weather. Shoal water extends 0.5 mile southward of **Sandy Point,** the western end of the island. **Mouatt Reef,** with a least depth of ½ fathom and marked by kelp, lies 0.4 mile offshore and 0.5 mile northward of Point Disney. The village of **Waldron,** with a wharf built out to 7 feet, is on the shore northeastward of Mouatt Reef. Waldron is served by the mail boat and has a small general store.

Bare Island, small, grassy, and bare of trees, is 0.5 mile northwestward of Point Hammond, and **Skipjack Island,** 120 feet high and wooded, is about 1.2 miles northwest of Point Hammond. The passage between them should be avoided on account of its high current velocity. A small, bare rock lies off the eastern end of Skipjack Island and another, awash, lies about midway between it and Bare Island. A light is on the northwest side of Skipjack Island.

Patos Island, 4.3 miles north-northeastward of Point Hammond, is 60 feet high and wooded except at its western end toward which it gradually decreases in height. **Active Cove,** at the southwestern extremity of the island, is reported to be a good anchorage for small vessels with local knowledge. **Patos Island Light (48°47.3′ N., 122°58.2′ W.),** 52 feet above the water is shown from a 38-foot white square frame tower on **Alden Point,** the

western point of the island; a radiobeacon and fog signal are at the station.

Sucia Islands, consisting of one large and several smaller islands, lie southeastward of Patos Island and 2.5 miles north of Orcas Island. The large island, 60 to 160 feet high and heavily wooded, is horseshoe-shaped; its western side is a series of steep, wooded cliffs. **Echo Bay** indents the eastern side of the island. In westerly weather small vessels with local knowledge can find good anchorage in 4 to 5 fathoms near the head of the bay. At the head of **Fossil Bay,** on the southern side of Sucia Islands, there is a State Parks and Recreation Commission small-craft anchorage and float pier; fresh water is available.

Reefs extend about 1.5 miles westward of Sucia Islands to **West Bank,** which has a minimum depth of 1 fathom. It is unwise to pass between the bank and the islands.

Clements Reef, half a mile northward of Sucia Islands, is about 1.2 miles long and 0.3 mile wide. It is marked by a buoy. The channel between this reef and Sucia Islands should not be attempted without local knowledge.

Boundary Pass, between Patos and Saturna Islands, is the widest and the most-used passage from Haro Strait to the Strait of Georgia.

The tidal currents are particularly heavy and dangerous between Patos Island and East Point on Saturna Island, B.C., and for 2 miles northward in the Strait of Georgia. The passage between Patos Island and Sucia Islands is almost free of tide rips, and the tidal currents set more fairly through it and are less strong and more regular than in Boundary Pass.

Haro Strait, southwestern approach (Canada).—The several channels and passages leading between the islands and dangers off the coast of British Columbia from Gonzales Point to **Cadboro Point,** 2.8 miles north-northeastward, constitute the southwestern approach to Haro Strait. These passages and channels should be used only by vessels with local knowledge.

The side of Haro Strait westerly of the international line is bordered by several islands and reefs, the most important of which are, from south to north: **Kelp Reefs,** about 7 miles northward of Discovery Island on the Canadian side; **Sidney Island,** some 3 miles northwestward of the light on Kelp Reefs; **Moresby Island,** 16 miles northward of Baynes Channel and Discovery Island, and the smaller islands and reefs in between.

Swanson Channel, used sometimes as an alternate route by vessels bound for Alaskan points, extends northwestward between Moresby Island and the **Pender Islands,** and connects ultimately with **Active Pass** to reach the Strait of Georgia in Lat. 48°53′ N.

Active Pass is deep but tortuous and in its narrowest part is about 600 yards wide. The dangers do not extend over 200 yards from shore. Vessels should enter the pass at slack water, if possible, but a vessel with a speed of 10 knots can always get through. A vessel with local knowledge can take advantage of the eddies and variations of the tidal currents, but others should keep in midchannel. Great care should be taken to avoid the shoals on either side of the northern entrance to the pass.

Enterprise Reef, in the southern approach to Active Pass, consists of two rocky heads covered less than 6 feet and about 400 yards apart; foul ground extends between the heads and 200 yards westward of the western head. A light is on the western head.

From the junction of Haro Strait and Swanson Channel, off Turn Point on Stuart Island, **Boundary Pass** leads between the Canadian islands and those on the United States side to Patos Island.

South Pender Island, 3 miles north of Stuart Island, is marked by a light on **Gowlland Point,** its southeasternmost extremity. The last of the Canadian lights in this stretch is 6.2 miles east-northeastward of Gowlland Point; this is the light on **East Point,** the eastern point of **Saturna Island.**

Rosenfeld Rock, 1.2 miles north-northeast of East Point, is marked by a buoy. The rock is covered by 1 fathom, and 5-fathom depths are within 800 yards of it. Close eastward of the rock, overfalls and dangerous tide rips are formed.

For more details of the islands and features on the Canadian side, see H.O. Pub. No. 10, Sailing Directions for British Columbia, published by the U.S. Naval Oceanographic Office, and British Columbia Pilot, Volume I, published by the Canadian Hydrographic Service.

San Juan Channel, the middle one of three principal channels leading from the Strait of Juan de Fuca to the Strait of Georgia, separates San Juan Island from the islands eastward. It is 13 miles long from its southern end to its junction with President Channel at the northern end. San Juan Channel is deep throughout, and except near its southern entrance, has few off-lying dangers.

Currents.—In the south end of San Juan Channel, between Goose Island and Deadman Island, the current attains a velocity of 5 knots or more and severe rips and eddies occur during flood. Current predictions for this location may be obtained from the Tidal Current Tables.

Cattle Point, the southeastern extremity of San Juan Island, forms the western point at the southern entrance to San Juan Channel. A light is on the point.

Salmon Bank, south of Cattle Point and on the western side of **Middle Channel,** is an extensive shoal covered 1½ to 3 fathoms; it is marked by a lighted bell buoy. Kelp grows on the rocks.

Lopez Island is the southeasternmost one of the San Juan Archipelago; **Lopez Hill,** 480 feet high, is near the southerly midsection of the island. **Iceberg Point,** 3.3 miles southeastward of Cattle Point, is at the western extremity of the southern part of Lopez Island. A light is on the point.

Long Island, 1.5 miles northwestward of Iceberg Point, is the largest of a group of islands and rocks lying off the southwestern part of Lopez Island. **Whale Rocks,** two dark rocks about 5 feet high, are on the eastern side of Middle Channel 0.6 mile westward of Long Island. There are 2¼-fathom spots nearby.

Richardson is a village on the northern shore of the cove northward of Iceberg Point, and close northward of **Charles Island.** Six fuel tanks are prominent from seaward. A wharf directly below the fuel tanks has a face 120 feet long and extends over rocks to a depth of 17 feet. Diesel oil and gasoline are available. Between the mainland and Charles Island there are overhead cables with clearance of 54 feet. A light is on a ledge extending from the shore off Richardson.

Mackaye Harbor, northward of Iceberg Point, affords good shelter in 5 to 6 fathoms, soft mud, and small craft with local knowledge can obtain excellent shelter in **Barlow Bay,** on the southern side of the harbor. Vessels approaching Mackaye Harbor or Richardson should pass at least 0.3 mile southward and eastward of the offlying islands and islets. Local vessels, by keeping close to the northern shore to avoid rocks near midchannel, use a small passage between Lopez and Charles Islands, but this should not be attempted without local knowledge. **Twin Rocks,** in midchannel, are marked by a daybeacon.

Davis Point, the southwestern end of Lopez Island, is on the eastern side of the south entrance to San Juan Channel. **Deadman Island** is close off the eastern side of the entrance and several rocks lie within 600 yards northward of the island. **Goose Island,** small and low, lies about 0.5 mile northward of Cattle Point and close off the western side of the entrance to San Juan Channel.

Shark Reef, awash, lies over a mile northward of Deadman Island and close off some white cliffs on the eastern side of San Juan Channel.

From Goose Island northerly to **Pear Point,** the easterly side of San Juan Channel is foul with many rocks covered and awash within 0.7 mile of the shore. However, good anchorage for small vessels can be had west of **Harbor Rock,** at the southerly end, between the 10- and 20-fathom curves.

North Bay is entered between Pear Point and **Dinner Island.** The village of **Argyle** is on the shores of North Bay. **Little Island,** at the head of North Bay, is connected to the mainland by a narrow spit. A small cannery is on Little Island and the shores of the island have been bulkheaded. The cove affords fair anchorage in 7 to 10 fathoms, about 800 yards northward of Dinner Island. In the approaches to the cove are two dangers, **Argyle Shoal,** covered 1¾ fathoms and marked by kelp, 0.6 mile eastward of Dinner Island, and a rocky shoal covered 1 fathom, marked by kelp, about 0.4 mile southeastward of Dinner Island. The passage westward of Dinner Island should not be attempted.

Fisherman Bay, on the eastern side of San Juan Channel abreast North Bay, is a shallow lagoon entered by a narrow, tortuous channel. Good anchorage with shelter from all winds may be had in 10 to 12 feet, soft bottom, for light-draft boats with local knowledge. The tidal currents have considerable velocity. **Lopez** is a small village at the entrance. About 2 miles northward of Lopez is the southern entrance to Upright Channel.

Chart 6379.—At **Turn Island,** off the east side of San Juan Island, San Juan Channel turns northwestward for about 9 miles, and connects at its northern end with Spieden Channel and President Channel.

Turn Rock, about 0.2 mile eastward of Turn Island, is a ledge bare at half tide; it should be given a berth of at least 100 yards. A light is on the rock. **Reid Rock,** 1.4 miles northwestward of Turn Rock, lies in midchannel off the entrance to Friday Harbor. The rock, covered by 2¼ fathoms, rises abruptly from deep water. It is buoyed.

Friday Harbor, 1.7 miles westward of Turn Island, is a small cove about 1 mile long and nearly as wide. **Brown Island** occupies the middle of the harbor, with shoals nearly 200 yards wide off both its eastern and southern shores; a shoal covered 2½ fathoms extends nearly into midchannel from the western shore of the island. The harbor may be entered either eastward or westward of Brown Island. Anchorage may be had off the wharves in 6 to 7 fathoms, and city floats provide berthing space for pleasure craft.

Friday Harbor, the town on the western shore of the cove, is a county seat and the center of a prosperous agricultural district. It is headquarters for the fishing fleet operating through the western part of the archipelago. Produce and fish are shipped and a salmon cannery, a creamery, and log booms are here.

The **University of Washington** maintains an oceanographical and marine biological research station, 0.6 mile northward of the town of Friday Harbor. The east pier, a high structure cantilevered about 35 feet out from shore, makes a prominent landmark in entering Friday Harbor. Near the main building is the landing wharf with a face 32 feet long and depths of 11 to 13 feet. The wharf is exposed to winds from the northeast, but is easily approached.

Friday Harbor is a customs port of entry but marine documents are not issued. The customs office is on the wharf at the ferry slip.

There are several wharves built out to deep water, the facilities of two oil companies having depths of 20 feet or more alongside. The city dock, in the easterly part of the harbor, has a depth of 16 feet alongside. Gasoline and diesel fuel are pumped. Water, groceries, and supplies are available.

At the south end of the harbor are two repair yards; the largest marine railway can haul out craft up to 100 tons for all general repairs. Depths off the railway and dock are 23 feet.

Communication between this harbor and other islands of the group is maintained by the ferries, by freight boats, and by aircraft.

Across the channel from Friday Harbor is **Point George,** the westerly point at the entrance to **Parks Bay.** Good anchorage for small craft in 6 to 8 fathoms, soft bottom, can be had in this bay. The head of the bay, however, is foul.

Wasp Islands lie in the western approach to West Sound between **Neck Point,** the northwestern tip of Shaw Island, and **Steep Point,** the southwestern extremity of Orcas Island. Several narrow channels lead between the islands; the channels in general use are the North and

Pole Passes, close under the Orcas Island shore. The tidal currents have considerable velocity in the channels, which should be attempted only by vessels with local knowledge.

North Pass, between Steep Point on Orcas Island and the Wasp Islands, leads eastward from San Juan Channel to Deer Harbor and into Pole Pass. The pass is about 0.2 mile wide between Steep Point and **Reef Island,** and is free of outlying dangers, except for a rock covered by 1¾ fathoms 0.3 mile eastward of the northern end of Reef Island.

Deer Harbor, east of Steep Point, has good anchorage in 6 to 7 fathoms about 0.2 mile from the head. **Fawn Island** lies near the entrance of the harbor and about 200 yards from the western shore; vessels may pass on either side. The eastern shore of Deer Harbor should be given a berth of at least 300 yards because of a shoal which in some places extends more than 200 yards off.

Deer Harbor, on the easterly side of the harbor, is a village with a small pier at which gasoline, groceries, and some hardware may be obtained. On the opposite shore are the ruins of an abandoned cannery.

A rock covered 4 feet lies about 100 yards north-northwestward of the wharf and constitutes a danger to vessels pulling away from the wharf.

Crane Island is off the entrance to Deer Harbor and almost a mile southeastward of Steep Point. The northern shore of the island is foul with bare and covered rocks within 250 yards of it. A rock lies 200 yards off the eastern point, with foul ground between it and the shore.

Pole Pass leads from Deer Harbor to West Sound, and separates Crane Island from Orcas Island; in its narrowest part the fairway is 75 yards wide. Pole Pass should not be attempted without local knowledge. A light is at the western end of the pass.

Wasp Passage leads from San Juan Channel to West Sound and separates Crane Island from the northern shore of Shaw Island. This passage should not be attempted without local knowledge. A light is on the rock 300 yards eastward of Bell island.

Bell Island, small and wooded, lies about 0.3 mile eastward of Crane Island. Vessels using Pole Pass pass Bell Island close-to in order to avoid reefs and shoals extending from the Orcas Island shore.

Cliff Island, the southernmost of the Wasp Islands, is 0.4 mile southwestward of Crane Island, and is marked by a light on its south side. **Low Island,** small and 10 feet high, is about 600 yards westward of Cliff Island. **Nob Island,** 40 feet high, is close-to and northwestward of Cliff Island. Local vessels bound from Friday Harbor to Deer Harbor use a clear, deep channel about 70 yards wide through the rocks and shoals lying between Cliff Island and Low Island.

Yellow Island, the westernmost of the Wasp Islands, lies about 0.8 mile west-northwestward of Neck Point and about 3.7 miles northeast of Friday Harbor. The island is small, grassy, and nearly bare of trees. A shoal extends 300 yards westward of the island and terminates in a rock marked by kelp and covered by about a fathom. This island should be given a berth of not less than 0.5 mile. **McConnell Island,** northeastward of Yellow Island, is the largest of the group. **Coon Island** lies close to and southeastward of McConnell Island. **Bird Rock,** which uncovers, lies between McConnell and Crane Islands, and is marked by a light.

Jones Island, 2 miles north of Wasp Passage, is on the eastern side of the northern entrance to San Juan Channel; the island is wooded. Small pleasure craft anchor in the bight in the northern shore. The State Parks and Recreation Commission maintains a small-craft pier and facilities here.

Spring Passage separates Jones Island from the southwestern part of Orcas Island. In general, the passage is free of danger.

Rocky Bay is a small open bight in the east side of San Juan Island. **O'Neal Islet,** surrounded by a shoal, lies almost in the middle of the bay.

Limestone Point, about 1.2 miles north-northwestward of O'Neal Islet, forms the western point of the northern entrance to San Juan Channel, and is the northeastern portion of San Juan Island. Heavy tide rips and eddies are formed off Limestone Point and Green Point on Spieden Island, 0.7 mile northward.

Flattop Island, prominent in the northern approaches to San Juan Channel, is a mile northeastward of the eastern end of Spieden Island. It is about 130 feet high, flat on top, and sparsely covered with underbrush and trees. **Gull Rock,** 30 feet high and bare, is about 0.3 mile northwestward of the northwesterly shore of the island.

Chart 6380.—White Rock, 35 feet high, is in the northern part of San Juan Channel, about midway between Flattop and Waldron Islands. Rocks, bare and covered, marked by kelp, extend nearly 0.3 mile northwestward from White Rock. **Danger Rock,** covered 3 feet and marked by kelp, lies 0.3 mile southeastward of White Rock.

The northwestern approach to San Juan Channel, from Haro Strait and Boundary Pass, extends between Waldron Island on the east and Stuart Island and its dangers on the west.

President Channel, between Waldron and Orcas Islands, is about 5 miles in length. Depths are generally great and the passage is free of dangers. The tidal currents have a velocity of 2 to 5 knots, and off the northern point of Waldron Island and between Waldron and Patos Islands there are heavy swirls and tide rips, especially with an adverse wind. The rips are generally heaviest with the ebb current. Rips and swirls are also heavy off Limestone Point and the eastern end of Spieden Island.

Orcas Island is wooded and mountainous. **Mount Constitution,** in its eastern part, is marked by a stone lookout tower. **Turtle Back Range** and **Orcas Knob,** conical, and bare on the summit, in the western part of the island, are prominent and easily recognized.

Point Doughty, the northwestern tip of Orcas Island, is bare and terminates in a small knob on its outer end.

Local magnetic disturbance.—Differences from the normal variation of 2° or more have been observed in the vicinity of Point Doughty.

Parker Reef, consisting of two rocky patches bare at low water, is about 0.7 mile off the northern shore of Orcas Island. Kelp covers the reef which is marked by a light.

A passage between Sucia Islands on the north and Orcas Island on the south connects the northern end of President Channel with the junction of the Strait of Georgia and Rosario Strait.

Chart 6379.—Minor Passages, San Juan Archipelago.—Upright Channel, between Lopez Island and **Shaw Island,** is about 3 miles long. **Canoe Island,** off **Flat Point,** contracts the passage to a width of less than 400 yards. Depths in the channel range from 20 to 25 fathoms. Anchorages for small craft may be had in **Indian Cove,** westward of Canoe Island, in 4 to 7 fathoms, soft bottom.

Harney Channel, between Shaw and Orcas Islands, is the widest approach to West Sound from the eastward. Depths are 10 to 25 fathoms, and there are no off-lying dangers.

Orcas, the settlement on the northern shore in a cove at the west end of Harney Channel, is a summer resort. A wharf with 10-foot depths off its face has gasoline and water available. The ferry slip just eastward of the wharf serves the inter-island ferry that operates from Anacortes. About 125 yards southward of the wharf is a rock covered 2½ fathoms; there is deep water between it and the shore.

Blind Bay, a small cove indenting Shaw Island just opposite Orcas, is shoal and in it there are several reefs. **Blind Island** lies in the entrance. **Shaw Island,** a village at the eastern entrance, is served by the ferry. It has a store, warehouse, and a float landing for small craft. **Broken Point,** 1.6 miles west of the Shaw Island landing, projects some 0.3 mile northward from the north side of the island. It is quite prominent.

West Sound indents the western part of the southerly shore of Orcas Island, for about 2.8 miles. The depths range from 7 to 20 fathoms. Anchorage in 7 to 12 fathoms may be had anywhere northward of **Double Island,** which consists of two small islands connected at low water; it is close to the western shore near the entrance.

West Sound, a settlement on the eastern shore about 2 miles inside the entrance, has a wharf with 12 feet off its end. Only a few piling remain of an old sawmill wharf. Care should be taken when leaving the wharf to avoid some submerged piling about 100 feet southwestward of it. Groceries in small quantities are available.

Sheep Island, a low islet in the southern part of the cove, is connected to the shore at low water; a shoal extends about 150 yards westward from the island. In the bight eastward of the island is a small-craft moorage with facilities for limited hull and engine repairs; gasoline, water, and some hardware are available.

Harbor Rock, partly bare, lies in midchannel about 0.8 mile from the head of West Sound; the rocky patch, marked by a daybeacon, is of small extent and is surrounded by depths of 2 to 10 fathoms.

Chart 6380.—East Sound indents Orcas Island northwestward for about 6 miles. Depths vary from 15 fathoms at the entrance to 9 fathoms less than 0.2 mile from the head. There are no outlying dangers and the shores may be approached to within 0.2 mile; however, a shoal covered less than 5 fathoms extends some 700 yards off the western shore, 0.8 mile inside the entrance. Anchorage may be had anywhere in the sound.

Local magnetic disturbance.—Differences from the normal variation of as much as 2° have been reported in the upper end of East Sound.

Olga, a summer resort, is on the western shore of **Buck Bay,** a small cove on the eastern shore of the sound, just within the entrance. There is a wharf with 20 feet at its head; groceries may be obtained in small amounts.

Cascade Bay, a small cove on the eastern side of the sound, about 3 miles north of the entrance, is the site of a landing with 25-foot depths alongside and yachting facilities. Diesel oil, gasoline, water, lubricants, groceries, and limited supplies are available. The lodge on **Rosario Point,** the western point of the bay, is conspicuous.

Eastsound, a summer resort in the westerly of two small adjoining coves at the head of the sound, is the second largest village in the archipelago. The wharf is built out to a depth of 10 feet; gasoline, water, and lubricants are obtainable. Communication with other islands and the mainland is maintained by aircraft and mail boat.

Obstruction Pass, with a least width of 350 yards, separates **Obstruction Island** from Orcas Island, and leads westward from Rosario Strait to the inner passage and sounds of the San Juan Archipelago. A covered rock, marked by kelp, has been reported in midchannel near its narrowest part. A small privately maintained float is in its northern extremity; gasoline, water, provisions in small amounts, and outboard motor repairs can be obtained. Obstruction Island is marked by lights.

Peavine Pass separates Blakely Island from Obstruction Island. The pass is a little over 200 yards wide at its narrowest part and in midchannel the least depth is 6 fathoms. Peavine Pass is safer and straighter than Obstruction Pass. A daybeacon marks a group of bare rocks which lie about 0.2 mile offshore from Blakely Island.

The currents through the passes have estimated velocities of 5.5 to 6.5 knots at times. Heavy tide rips occur eastward of Obstruction Island.

A rock covered 1¾ fathoms is 1.3 miles southwestward of Peavine Pass light.

Blakely Island, easterly of Lopez and Shaw Islands, is privately owned and maintained but open to the public. At its northern end, bordering on Peavine Pass, is a small-craft basin and channel, with moorings both at the cove dock and inside the basin. An airplane landing strip and lodging are nearby. Marine hardware, some small-craft repairs, diesel oil, gasoline, water, ice, and groceries are available.

Thatcher Pass, between Blakely Island and **Decatur Island,** is about 0.5 mile wide in its narrowest part. The pass is deep and free of danger, except for buoyed **Lawson Rock** in midchannel 700 yards northward of Fauntleroy Point.

Fauntleroy Point, the northeastern end of Decatur Island, is marked by a light and fog signal. With a southerly wind and ebb current, heavy rips will be encountered off the eastern entrance to Thatcher Pass.

Lopez Sound, on the eastern side of Lopez Island, may be entered from Rosario Strait by Thatcher Pass. The depths in the greater part of the sound are 3 to 5 fathoms, muddy bottom, but along the eastern shore there is a narrow and deeper channel.

Fair protection in southeasterly weather can be had in the area west of **White Cliff** on Decatur Island and north of **Center Island** in 3 to 5 fathoms, mud bottom. Strong winds blow across the low neck south of White Cliff and may make this uncomfortable for small craft. Good anchorage in westerly weather can be had on the west side of the sound in the large bight.

Leo Reef, which uncovers, is in the entrance to **Swifts Bay** and is marked by a light. **Port Stanley** is a small village on the shores of Swifts Bay.

Upright Head, the northernmost point of Lopez Island, is a narrow peninsula which attains an elevation of 260 feet. A ferry slip is in the small cove at the tip of this peninsula. A privately maintained light is 50 yards out from the slip. There is daily ferry service with the other islands and the mainland.

Decatur, a small village, is on the western side of Decatur Island. A wharf with 8 feet of water at its end is here.

Lopez Pass, south of Decatur Island, leads from Rosario Strait into Lopez Sound. The pass has depths of 9 to 12 fathoms, but is very narrow and little used. A light is at the south end of Decatur Island.

Rosario Strait, the easternmost of the three main channels leading from the Strait of Juan de Fuca to the Strait of Georgia, is 20 miles long and from 1.5 to 5 miles wide. The water is deep and the most important dangers are marked.

The strait is in constant use by vessels bound to Bellingham, Anacortes, and the San Juan Islands. Vessels bound for British Columbia or Alaska also frequently use it in preference to the passages farther westward, when greater advantage can be taken of the tidal currents.

Currents.—For times and velocities of current in Rosario Strait and vicinity, the Tidal Current Tables should be consulted. The currents in Lopez, Thatcher, and Obstruction Passes are reported to attain velocities of 3 to 7 knots. This should be kept in mind when proceeding through Rosario Strait, particularly at night or in thick weather. On the ebb of a large tide off the entrance to the passes, a southerly wind causes tide rips which are dangerous to small craft.

Small craft can get good protection from westerly and southerly weather by anchoring near the head of **Watmough Bay,** at the extreme southeastern end of Lopez Island.

Colville Island, 64 feet high, small and bare of trees, is off the southeastern end of Lopez Island. It should be given a berth of not less than a mile.

Davidson Rock, which bares, is 0.3 mile eastward of Colville Island; it is marked by a light. Heavy kelp extends westward of Colville Island.

Aleck Bay, the westernmost and largest of three small bays on the southern shore of Lopez Island, affords good anchorage except in heavy southeasterly winds, for small vessels in 4 to 7 fathoms, mud bottom. Rocks, awash and covered, and reefs abound in these waters, and caution is essential.

A bank covered 10 to 20 fathoms extends across the southern entrance to Rosario Strait. A shoal covered 3¾ fathoms and marked by a lighted buoy is in the western part of the bank, 2 miles eastward of Davidson Rock. **Lawson Reef,** small in extent with a least depth of 1¾ fathoms and marked by a buoy, is in the eastern part of the bank, 1.7 miles westward of Deception Island.

Chart 6376.—Deception Pass, between Whidbey Island and **Fidalgo Island,** provides a 2-mile passage connecting the northerly end of Skagit Bay with the southerly end of Rosario Strait. Near its middle the width is reduced to 200 yards by **Pass Island,** over which is the fixed highway bridge with clearance of 144 feet at the center of the arch. Power and telephone cables some 0.2 mile eastward have minimum clearance of 150 feet.

Deception Pass is used frequently by local vessels bound from Seattle to Anacortes, Bellingham, and the San Juan Islands. The pass should be negotiated at the time of slack, since the velcoity of the stream at other times makes it prohibitive to most vessels. However, some fast vessels run it at all stages of the tide. The pass is also used by log tows from the northward, bound to Everett or Seattle, which prefer this route to avoid the rough weather westward of Whidbey Island.

Currents in the narrows of Deception Pass attain velocities of 5 to 8 knots or more, at which times strong eddies are formed along the shores. With westerly weather, heavy swells and tide rips form and make passage dangerous to all small craft. Daily predictions are given in the Tidal Current Tables.

Canoe Pass, north of Pass Island, is not recommended except for small craft with local knowledge.

Deception Island, a mile west of Pass Island, is 0.4 mile northwestward of **West Point,** the northwestern end of Whidbey Island. Foul ground exists between West Point and Deception Island. Vessels should not attempt to pass between them, and should always stay in **Northwest Pass.**

Strawberry Island lies almost in the middle of Deception Pass, 0.4 mile eastward of Pass Island. **Ben Ure Island** is 0.2 mile southward of Strawberry Island at the entrance to Cornet Bay; a light is at the northeastern end of the island.

Cornet Bay, shallow and suitable for small craft only,

indents the northern end of Widbey Island, in Deception Pass. There is a wharf on the eastern side with floats for boat moorage. Naval Air Station crash boats are berthed here. Privately owned boats are allowed to land on the eastern side. At the head of the bay are two floats privately maintained for the mooring of yachts. Power cables over the westerly end of Cornet Bay have a clearance of 58 feet.

Routes.—From westward the best water through Deception Pass will be found 0.2 mile westward of **Rosario Head,** a point 0.5 mile northeast of Deception Island. Steer a southeasterly course to pass about 100 yards southwestward of the light on Lighthouse Point; then follow an easterly course through the middle of the pass, being careful to guard against sets from the current when running partly across it. After passing under the bridge, favor slightly the northern shore so as to avoid the pinnacle rocks and ledges making out from the southern shore. After leaving Pass Island, steer to pass about midway between Ben Ure and Strawberry Islands. Strawberry Island should not be approached within 125 yards because a reef, marked by kelp, extends southward of the island. From a position off Ben Ure Island Light, steer a northeasterly course to pass about midway between **Hoypus** and **Yokeko Points.** North and west of Strawberry Island the flood current sets northeastward and this set should be guarded against.

Reservation Bay, a small bight between **Reservation Head** and Rosario Head, offers anchorage for small craft in 2¼ fathoms, mud bottom. **Northwest Island,** 28 feet high and grass-covered, is between Rosario and **Sares Head,** which is a mile northward of Deception Island. Sares Head is steep-to and 480 feet high.

Burrows Bay indents the western shore of Fidalgo Island between **Langley Point** and **Fidalgo Head.** It is a broad, open bight, affording anchorage in the northern part in 15 to 16 fathoms, soft bottom. Protection from westward and northward is afforded by **Burrows** and **Allan Islands,** but the bay is exposed to southerly weather. In the southeastern part, the depths are less than 6 fathoms, and in places shoals extend almost 0.4 mile off the eastern and southern shores of the bay. Eastward of the passage between Allan and Burrows Islands there is a middle ground with a least depth of 5 fathoms. Vessels using Deception Pass, bound to or from ports in the islands or from Bellingham Bay, pass through Burrows Bay and the passage northward of Burrows Island.

Burrows Island Light (48°28.6′ N., 122°42.7′ W.), 57 feet above the water, is shown from a 34-foot white square tower on a building at the western end of the island; a fog signal is at the station.

Local magnetic disturbance.—Differences from normal variation of 4° have been observed on the eastern shore of Burrows Bay, and as much as 2° off March Point.

Williamson Rocks, a group of small, grass-covered islets and rocks, lie 0.5 mile southward of Allan Island. **Dennis Shoal,** which bares, is 500 yards off the southern shore of Allan Island and 0.6 mile northwestward of Williamson Rocks. The easterly side of Burrows Bay is generally foul as much as 0.5 mile offshore.

Flounder Bay, the small lagoon at the northerly end of Burrows Bay, provides shelter for small craft: in 1962, the controlling depth in the entrance was 9 feet, thence 6 to 2 feet to the finger piers and floats.

Chart 6380.—Bird Rocks, consisting of three rocks close together, are almost in the middle of Rosario Strait, about 2 miles west by north of Burrows Island Light; the southernmost and largest is 37 feet high. There is deep water close-to, and passage may be made on either side of the rocks.

Belle Rock, bare at extreme low water, is about 0.5 mile northeastward of Bird Rocks. A light is on the rock. **Tide Point,** the western extremity of Cypress Island, and **Lawrence Point,** the eastern end of Orcas Island, in range, bearing about 359°, leads 1,200 yards eastward of Belle Rock.

The west side of Rosario Strait is generally clear, with great depths, except for the following principal offshore dangers:

Kellett Ledge, 2 miles northward of Point Colville, extends 700 yards off **Cape St. Mary,** on the southeasterly part of Lopez Island. The ledge is marked by kelp, and uncovers at lowest tides.

James Island is close off **Decatur Head,** the eastern end of Decatur Island, and between the two is a deep but narrow passage; on the island are two hills with heights of 260 and 219 feet.

Pointer Island, 16 feet high, is 600 yards off the southeastern shore of Blakely Island. **Black Rock,** 4 feet high, is 0.5 mile off the Blakely Island eastern shore; it is marked by a daybeacon.

Cypress Island, 1,530 feet high, steep on the lower slopes and gently rounding at the top, is on the east side of Rosario Strait and opposite Blakely Island. From southward the island appears to lie in the middle of Rosario Strait.

From **Reef Point,** the southwestern tip of Cypress Island, a shoal extends 0.4 mile southward, and is marked at its end by a buoy. Vessels rounding the point should give the buoy a berth of 400 to 500 yards to avoid submerged piles that may remain in the area.

Strawberry Island, small and low, is about 400 yards off the western shore of Cypress Island. Passage eastward of it is not recommended. An indifferent anchorage may be had in **Strawberry Bay** in 7 fathoms; it is seldom used.

Lydia Shoal, a small patch covered by 3¾ fathoms, lies a mile eastward of Obstruction Pass Light. **Peapod Rocks,** marked by a light, are a mile south of Lawrence Point on Orcas Island. This group of rocks extends about a mile in a north-northeasterly direction, some 0.5 mile from the Orcas Island shore, which itself is fringed with rocks and reefs. The light and fog signal are on the largest, which is the northernmost rock of the group.

Buckeye Shoal, with a least depth of 3½ fathoms, lies a mile south-southeastward from **North Peapod Rock,** and is marked by a lighted buoy. Between this and the north end of Cypress Island are **Cypress Reef,** a dangerous rocky patch, and **Towhead Island,** 0.3 mile to the east-

ward and about 400 yards northward of the north end of Cypress Island. The passage between the two is used by local vessels, especially those plying between Obstruction Pass and Bellingham Bay.

Doe Bay indents the southeastern shore of Orcas Island abreast Peapod Rocks. **Doebay,** a village on the bay, has a wharf with 12 feet at its end; during strong southerly winds the wharf should not be approached.

Sinclair Island, northward of Cypress Island, is wooded and comparatively low in places; dangerous reefs extend 0.8 mile off the northern shore. Portions of **Boulder Reef,** the outermost danger, uncover at half tide; kelp marking the reef is frequently drawn under by the current. The outer end of the reef is marked by a buoy. **Urban Landing,** a village at the southwestern end of the island, has a wharf with 12 feet of water alongside.

Lummi Island, wooded and about 8 miles long, forms the eastern side of the northern end of Rosario Strait, opposite Orcas Island. The northern part is low, but in the southern part **Lummi Peak** attains an elevation of 1,740 feet.

Lummi Rocks are off the southwestern shore of Lummi Island about 3 miles northwestward of **Carter Point,** the southern tip. They are marked by a light.

Shoals extend over 0.5 mile from **Point Migley,** the northwestern extremity of Lummi Island; the northwestern edge of the shoals is marked by a buoy. Sinclair Island, open westward of **Village Point,** leads westward of this shoal.

Clark Island and **Barnes Island,** and the several adjacent rocks and islets, lie almost in the middle of Rosario Strait, about 2.5 miles north-northwestward of Lawrence Point on Orcas Island. These islands may be passed on either side, giving them a berth of 0.5 mile.

Matia Island, a wildlife refuge about 4 miles westward of Point Migley, is 120 feet high and wooded. A freshwater spring is at the head of the small cove on the southeastern point. **Puffin Island,** with a reef extending about 400 yards eastward from Matia Island, is marked by a light.

Alden Bank, 3 miles north of Matia Island, within the 10-fathom curve is about 3 miles long in a southeasterly direction. The shoalest part, on which are patches of 2¼ and 3 fathoms, covering a considerable area, is near the southeastern part of the bank. A lighted bell buoy is at the southern edge and an unlighted buoy at its eastern edge.

Chart 6376.—Skagit Bay, between the northern part of Whidbey Island and the mainland, is entered from the north through Deception Pass and from the south through Saratoga Passage. Skagit River, described in the next chapter, empties into the southeastern part of the bay.

The greater portion of Skagit Bay is filled with flats, bare at low water. Shoals extend 100 to 300 yards off the Whidbey Island Shore.

Along the shore of Whidbey Island, between it and the edge of the flats, is a natural channel varying in width from 0.2 to 0.5 mile, except at Hope Island, where it narrows to 150 yards. The channel is marked with lights from Deception Pass to the jettied entrance of Swinomish Channel. The main channel from Deception Pass southward through Skagit Bay has depths of 6 fathoms or more.

Velocity and direction of the current vary throughout this channel. The flood current enters through Deception Pass and sets in a generally southern direction. The ebb flows in a general northerly direction. Southwest of Hope Island, the velocity is 2.3 knots on the flood and 2.0 knots on the ebb. South of Goat Island the velocity is 1.8 knots on the flood and 1.4 knots on the ebb. North of Rocky Point the velocity is 0.6 knot on the flood and 1.0 knot on the ebb. For daily predictions, consult the Tidal Current Tables.

Similk Bay, at the northern end of Skagit Bay, is used for log-rafting operations and is unsafe for navigation. Just southward of this bay are **Skagit Island** and **Kiket Island,** about opposite the eastern entrance to Deception Pass. They are, respectively, 111 feet and 194 feet high. **Hope Island,** 0.7 mile southward of Skagit Island, is fringed with rocks off its eastern side, and its western point is marked by a light. Across the channel from it is **Ala Spit,** a low projecting point within a shoal extending nearly 350 yards eastward.

Good anchorage may be had northward of Hope Island, and vessels at times make use of this anchorage area while waiting for slack water in Deception Pass.

The narrow channel eastward of Hope Island is used by small craft with local knowledge. This channel, with a controlling depth of 5 fathoms, passes 130 yards off the Hope Island shore. The bottom is rocky and very irregular, and numerous dangers marked by heavy kelp are between the channel and the Fidalgo Island shore. Southward of **Hunot Point** is summer anchorage for pleasure craft.

Seal Rocks, 1.4 miles southward of Hope Island, lie on the eastern side of the main channel. They are marked by a light.

Swinomish Channel connects the waters of Skagit Bay with those of Padilla Bay, 5 miles northward. Federal project depth is 12 feet. In 1962 the controlling depth was 11 feet.

The channel leads east-northeastward north of **Goat Island,** which is rocky, steep, and timber-covered, and thence through **Hole in the Wall,** in the southern part of Fidalgo Island. The jettied entrance and the channel inside are marked with aids to navigation.

Swinomish Channel is crossed by a fixed highway bridge with clearance of 75 feet, just south of La Conner. The stub remains of the former swing bridge are now blocked off. At the Padilla Bay entrance are two drawbridges, highway and rail; the highway lift bridge clearances are 16 feet down and 78 feet up, and the railroad swing span clearance is 5 feet. The rail span is left open until trains approach. Power and telephone cables crossing the channel have minimum clearance of 73 feet.

Most of the yachts going between Bellingham and

Seattle prefer Swinomish Channel to Deception Pass because of the weaker currents and shorter run. The channel is used extensively for towing logs.

La Conner, near the southern end of Swinomish Channel, is the center of a rich agricultural district. It has marginal wharves with depths alongside of 4 to 15 feet. A repair yard marine railway can haul out craft up to 20 tons for general repairs. Groceries, gas and diesel oil, and some marine hardware are obtainable.

Guemes Channel, between Guemes Island on the north and Fidalgo Island on the south, leads eastward from Rosario Strait to Padilla Bay. The channel, which is about 3 miles long and 0.5 mile wide at its narrowest point, has depths of 8 to 18 fathoms. Buoys mark the channel at the western entrance.

Local magnetic disturbance.—Differences from normal variation of as much as 14° have been observed off the southeast point of Guemes Island.

Shannon Point, the southern point at the western entrance to Guemes Channel, is low and rounding. It is marked by a lighted buoy. A rocky shoal extends 200 yards northward from the point.

In Guemes Channel the current velocity exceeds 5 knots at times. It is reported that the flood (eastward current) is accompanied by an eddy between the eastern end of Guemes Island and Capsante, with the westward counter current extending about 200 yards from the shore along the north side of Fidalgo Island.

Current predictions for Guemes Channel may be obtained from the Tidal Current Tables.

Ship Harbor is a bight close eastward of Shannon Point, at the western entrance to Guemes Channel. The interisland ferry slips and headquarters are here.

City of Seattle Rock, covered 1½ fathoms, is 200 yards offshore on the southern side of the channel, 2 miles eastward of Shannon Point.

Anacortes, on the southern shore of Guemes Channel, is the center of an extensive salmon-canning industry, and canneries with wharves built out to depths of 12 to 20 feet, line the north waterfront. A large fertilizer factory, veneer plant, shingle mill, and cold storage plant are here. The port is incorporated as the **Port of Anacortes.** Commerce includes logs and lumber products, seafood, salmon fertilizer, petroleum products, and farm produce.

Capsante Waterway, leading to the eastern waterfront of Anacortes, is marked by a lighted range, daybeacons, and lights on the ends of the breakwaters forming the boat harbor. Federal project depth is 12 feet from deep water in Fidalgo Bay to a mooring basin of the same depth inside the harbor. Controlling depth in this channel usually is about 10 feet.

Anchorage may be had off the wharves in 6 to 12 fathoms. During periods of strong current, vessels at anchor in the channel should guard against dragging as the holding ground is poor.

Tides.—The mean range of tide at Anacortes is 4.8 feet while the range between mean lower low water and mean higher high water is 8.2 feet.

Pilotage.—Pilots may be obtained through the Puget Sound Pilots' Association, Seattle.

Towage.—Several local tugboats are available.

Quarantine.—Vessels subject to quarantine usually proceed to their docks where they are boarded for inspection. If vessels require fumigation after discharging cargo at Anacortes, this service is performed at the port. Advance notice should be given the senior surgeon of the U.S. Public Health Service of Seattle. An outpatient office is in the city.

Customs.—Anacortes is a port of entry.

Immigration officials are stationed at Anacortes.

Harbor regulations are enforced by the harbormaster who can provide a copy of the regulations.

Wharves.—The port wharf at the foot of Commercial Street is used for general cargo. It has a frontage of over 600 feet, and depths alongside are maintained at 30 feet by the port commission. Covered storage space is available. A fog signal is on the wharf.

Supplies and repairs.—Fuel oils in any quantity, water, groceries, and marine hardware can be obtained. A shipyard with a marine railway having a capacity of 300 tons is in Anacortes. There are several marinas for servicing and accommodation of small craft. They are equipped for both hull and engine repairs.

Communications.—The city is served by freight rail service and by bus. Ferry service is maintained to Guemes Island and the San Juan Archipelago, with connections to Sidney on Vancouver Island, B.C.

A Coast Guard patrol boat operates from Anacortes Harbor.

Fidalgo Bay, a shallow arm of Padilla Bay, extends southward from the eastern end of Guemes Channel. A shallow channel leads through the flat toward the head of the bay.

Padilla Bay, between the mainland and the northern part of Fidalgo Island, is largely occupied by drying flats, but deep water lies eastward of Capsante and Guemes Island. Entrance to the bay may be had from Rosario Strait through Guemes Channel; a passage eastward of Guemes Island leads into Padilla Bay from the northward.

March Point, low and wooded, is at the northern end of the peninsula between Fidalgo and Padilla Bays. Here there are oil facilities to accommodate the largest supertankers able to make the 42-foot channel. Vessels come to the easterly pier to bunker fuel.

Chart 6378.—William Point, 100 feet high, is the western point of **Samish Island,** which forms the northern side of Padilla Bay. The point is wooded and, because of the low land eastward of it, appears as an island although it is connected with the mainland. It is marked by a light.

Bellingham Channel, deep between Cypress and Guemes Islands, is the most direct route to Bellingham Bay from southward. Between Cypress, Guemes, and Sinclair Islands the tidal currents have considerable velocity, but between Sinclair and Vendovi Islands their velocity is considerably less.

A light is on the western side of Bellingham Channel

off the eastern side of Cypress Island. **Cone Islands,** a group of five islets on the western side of Bellingham Channel, lie 0.4 mile east of the northeastern side of Cypress Island.

Clark Point, on the eastern side of Bellingham Channel, is a steep bluff forming the northern point of Guemes Island. A reef extends 300 yards northward from the point. **Vendovi Island,** 1.8 miles northeastward of Clark Point, lies on the southeastern side of the southern approach to Bellingham Bay. Shoaling to 4¼ fathoms, 0.4 mile southwestward of Vendovi Island, is marked by a buoy.

Deep-draft vessels approaching Bellingham Bay from northward use the channel between Lummi and Sinclair Islands. With the exception of Viti Rocks and the dangers northward of Sinclair Island, this channel is free of danger. The fairway is deep and has a width of 0.6 mile at its narrowest part, between **Viti Rocks and Carter Point,** the southern tip of Lummi Island. The northwesternmost Viti Rock is 35 feet high, 200 yards long, and marked by a light.

A **measured course,** 6,484 feet long on bearing **160°34′,** is eastward of Eliza Island. The southerly markers are the lights on Viti Rocks and Eliza Rock; the northerly markers are white tripods—the front marker on the north tip of Eliza Island and the rear marker on the shore of Lummi Island.

Hale Passage, separating Lummi Island from the mainland northeastward, is 6 miles long. Depths vary from 2 fathoms on the bar near the northwestern end to 20 fathoms in the southeastern end of the channel.

Lummi Point, on the western side of Hale Passage 1.5 miles southeastward of Point Migley, is marked by a lighted buoy.

Lummi Island, a village on the western side of Hale Passage, is a mile southward of Lummi Point. Just westward of the old ferry slip is a small wharf equipped with a trolley for launching and hoisting small pleasure craft. There is a 70-foot float alongside from which gasoline and other petroleum products are available to small craft.

From **Point Frances,** the rounded high bluff at the southeastern entrance of Hale Passage, a shoal and broken ground extend south-southeasterly to Eliza Island. The depths range from 4½ to 1½ fathoms about midway between the point and the island. Buoys mark the critical areas.

Bellingham Bay, from William Point to the head, is about 12 miles long and 3 miles wide. Anchorage may be obtained almost anywhere in the bay southward of the flats; the depths, over the greater portion, range from 6 to 15 fathoms. Because of the mud bottom, vessels are apt to drag anchor in heavy weather.

Samish Bay, separated from Padilla Bay by Samish Island, with flats bare for a considerable distance at low water, constitutes the southeastern part of Bellingham Bay. Extensive oyster culture is carried on in the eastern portion of the bay.

Eliza Island, low and partly wooded, lies 1 mile northeastward of Carter Point. Shoals fringe most of the island which should not be approached closer than about 400 yards. A rock covered 1 fathom lies some 500 yards north of the westerly tip of the island.

Eliza Rock, marked by a light and fog signal, is off the southern end of the island.

Chuckanut Bay, which indents the eastern shore of Bellingham Bay, is a cove affording shelter to small vessels.

Post Point, on the southeastern side of Bellingham Bay, is 1.5 miles north-northwestward of the northern entrance point of Chuckanut Bay. A sand spit, marked by a lighted bell buoy, extends about 450 yards from the point. **Starr Rock,** covered 1¼ fathoms, is 300 yards offshore, 0.7 mile southwestward of the entrance of the Whatcom Creek Waterway; it is marked by a buoy. Vessels should not pass inside the rock.

A haven for a large number of small boats is adjacent to and eastward of Squalicum Creek Waterway. Ice, fuel, provisions, and repair facilities are available.

Bellingham is at the head of Bellingham Bay on the eastern shore. The principal products are wood pulp, canned fish, cement, lumber processed milk, and agricultural products. There is a repair yard here. A cannery and boat-building yard are in South Bellingham. A Coast Guard patrol boat is stationed in Squalicum Creek Waterway.

Prominent features.—The local newspaper building bears the lighted sign HERALD which is particularly prominent at night. By day the Bellingham Museum, a red brick building with a tower, shows prominently. The stack at the cement plant, 1.8 miles northwestward of Whatcom Creek Waterway, is conspicuous.

A light and fog signal are on the warehouse of the municipal wharf at the entrance to the **Whatcom Creek Waterway.**

A light is on the east side of the channel at the entrance to **Squalicum Creek Waterway.** The southerly entrance to the small-boat basin eastward of this waterway is between two breakwaters, the channelward ends of which are marked by lights. A fog signal is also on the end of the southerly breakwater. The entrance from the Squalicum Creek Waterway is marked by a light.

Channels.—Federal project depth is 30 feet in Whatcom Creek Waterway to within 300 yards of the bridge, and 26 feet in Squalicum Creek Waterway. The **Port of Bellingham** assist the Federal Government in dredging and maintaining channel depths. The port authority maintains depths of 30 feet or better alongside the Whatcom Creek Waterway facilities, and also dredges out the small-craft basin. The Squalicum Creek Waterway depths are 20 feet or more.

Anchorages.—The bottom mud is a thin accumulation over hardpan and is not good holding ground in heavy weather. A general anchorage and an explosive anchorage are in the bay; limits and regulations are given in **202.230,** Chapter 2.

Tides.—The mean range of the tide at Bellingham is

5.2 feet; the range between mean lower low water and mean higher high water is 8.6 feet. A range of about 14 feet may occur at the time of maximum tides.

See Appendix for **storm warning displays.**

Pilots may be obtained from the Puget Sound Pilots' Association, Seattle.

Towage.—Tugboats of any size required for the traffic are available.

Quarantine.—Vessels which require quarantine inspection usually proceed to their docks, where they are boarded by quarantine officers.

An outpatient office of the U.S. Public Health Service is in the city.

Customs.—Bellingham is a port of entry; marine documents are issued.

Immigration officials are stationed in the city.

Harbor regulations are prescribed for Bellingham Harbor, and are enforced by a harbormaster whose office is on the Central Avenue Dock, at the head of the waterway. It is at this location that the city maintains a small-boat harbor, under supervision of the harbormaster, for short-berthage transient boats only, for which no charge is made. **Speed limits** are 6 miles an hour within 2,000 feet of the wharves, and from 2,000 feet and 1 mile of the wharves, 8 miles an hour. The Port of Bellingham office is on the port wharf.

Wharves.—A number of wharves are built out from the northern and eastern shores with depths of 18 to 35 feet alongside. Ordinary facilities are available for handling dry cargo, including a logger-hauler and a 60-ton barge crane. There are several warehouses. A large cold storage plant and an ice plant are along the Squalicum Creek Waterway.

Supplies.—Provisions and marine hardware may be obtained. Water can be had at the wharves and gasoline and fuel oil at the oil docks.

Repairs.—There are marine railways available. Major hull and engine repairs can be made to vessels not exceeding 1,500 tons, at dockside. A floating crane has a capacity of 80 tons.

Communication.—Radiotelephone service is available. The airport is about 1.5 miles northwestward of the city. Bellingham is on U.S. Highway 99 and the Great Northern Railway.

Chart 6300.—The **Strait of Georgia** extends some 115 miles northwestward from its southerly end, in the vicinity of Alden Bank, and is bordered on the west by Vancouver Island, B.C., and on the east by the mainland of Canada. General depths are great, and in many places exceed 200 fathoms.

Vessels bound to the Strait of Georgia from Puget Sound should give the southwestern shore, between Boundary and Active Passes, a berth of at least 2 miles because it is fringed with dangers. Point Roberts, on the northern shore, affords an excellent landmark.

Currents.—In the Strait of Georgia, the tidal currents are not nearly as strong as those in the channels leading to it from the Strait of Juan de Fuca. The currents in the Strait of Georgia attain a velocity of 3 knots at times, particularly during the freshets of the summer, when the Fraser River discharges a large volume of fresh water. This fresh water, which has a peculiar milky color, flows across the banks at the mouth of the river and almost directly toward Active Pass. Frequently this water extends entirely across the strait and at times reaches into the inner channels along the shore of Vancouver Island; at other times, it reaches only to the middle of the strait and forms a striking contrast with the deep blue water of the Strait of Georgia.

In the middle of the strait northward of Patos and Saturna Islands, the velocity of the current varies from 1 to 3 knots, seldom exceeding the latter. The velocity is still less northwestward of the mouth of the Fraser River, where the width of the strait is about 15 miles. Southeastward of the mouth of this river tidal currents are slightly stronger off the southern shore than off the northern one; within a line joining Point Roberts and Sandy Point, the currents are scarcely felt and vessels can take advantage of this, especially since good anchorage can be obtained in this vicinity.

The tidal currents are stronger close to the southern shore which is swept by the rapid currents out of Active, Porlier, and Gabriola Passes. The south-going tidal currents in the Strait of Georgia sets strongly southwestward into Active Pass.

Chart 6380.—Between Sandy Point, the western point of **Lummi Bay,** and **Cherry Point,** about 4.5 miles north-northwestward, the shore of the mainland forms a bight in which there are no off-lying dangers. An oil-loading wharf with a trestle approach extends 0.4 mile from shore at **Ferndale,** 2.4 miles north of Sandy Point. Depths alongside the outer face are 42 feet. The wharf is marked by a privately maintained fog signal.

A large oil refinery tower, 0.8 mile inshore, is prominent.

Point Whitehorn, about 2.8 miles northwestward of Cherry Point, is a conspicuous, bold bluff about 150 feet high; its seaward face is a steep cliff of white clay.

Chart 6300.—**Birch Bay,** on the eastern side of the Strait of Georgia between Point Whitehorn and **Birch Point,** is an open bight. It affords some protection, in 4 to 5 fathoms, from northward, but is open to the southwest. Flats that bare occupy a considerable area at the head of the bay. A number of resorts are along the shores.

The **International Boundary** between the United States and Canada is marked by three sets of range lights where it crosses Semiahmoo and Boundary Bays. One set is in the eastern part of Semiahmoo Bay and the other two sets are northward of Point Roberts on the western side of Boundary Bay.

The **Peace Monument** on the boundary is a white masonry arch, facing north and south, about 28 feet above the ground. It is a distinctive landmark as it stands alone and shows offshore against a background of dark trees.

Caution.—The International Rules govern in all Canadian waters.

Point Roberts is the prominent feature in approaching from either northward or southward. The eastern face is about 180 feet high and is composed of white, vertical bluffs. The point is well wooded, and owing to the low land behind it, is usually made as an island, especially from southward. The southwestern extremity of the point is marked by a light. Extensive night drift-fishing in the area from Point Roberts to Blaine makes night navigation difficult.

Temporary anchorage may be obtained westward of Point Roberts in 8 fathoms, good holding ground, about 1 mile 321° from Point Roberts Light. The position is about 0.3 mile from the edge of Roberts Bank; vessels should not anchor any farther northward.

Chart 6399.—Semiahmoo Bay has its entrance between Birch Point and Kwomais Point, about 5 miles north-northwestward. It is connected with Drayton Harbor by a narrow channel. The eastern part of the bay is shoal. Anchorage may be had in the bay in 3½ to 9 fathoms on the northwest side of Semiahmoo Spit, affording protection from south and southeasterly storms.

Drayton Harbor is a small cove formed by **Semiahmoo Spit,** the extension of a sandspit northward of Birch Point. It is about 2 miles in extent, but flats that bare at low water occupy a large area in the eastern and southern parts of the harbor.

A light and fog signal are near the northern end of the extensive sand flats off the northwestern side of Semiahmoo Spit. Buoys mark the edges of the flats near the entrance.

The channel from Semiahmoo Bay to the cannery dock on Semiahmoo Spit has a controlling depth of 28 feet. There is a 16-foot spot 130 yards northward of the cannery wharf on the spit.

The southeasterly half of the harbor is so filled with flats that even high-water navigation for small boats is hazardous because of boulders and old piling.

Blaine is near the entrance on the northern shore of Drayton Harbor. Blaine city wharf, with a depth of 24 feet along its face, has a service station where water and petroleum products for small craft can be obtained. Extreme caution is advised on entering or leaving the wharf. Rocks awash at low stages of the tide are located immediately off the west end of the south face of the wharf. A well protected boat basin with a depth of 12 feet is on the south side of the city wharf. Inside the stone breakwater is a small-boat harbor which can accommodate more than 300 craft at the moorings; a harbormaster is on duty at the basin. A marine railway here can haul out craft up to 500 tons for general repairs. Off the railway the depth is 4 feet. Groceries, hardware, gasoline, diesel oil, ice, water, and fishing supplies are available.

Several buildings, an elevated tank, and a cannery constituting the town of **Semiahmoo,** are at the northern end of the sandspit. A depth of 30 feet is off the large cannery wharf. Adjacent to the cannery is a marine railway, for exclusive use of the cannery boats.

To enter Drayton Harbor from Semiahmoo Bay, pass about 300 yards northward of Semiahmoo Harbor Light, and steer a course about midway between the cannery wharves and the boat basin. After passing the cannery wharves, favor the northern side of the channel to avoid the spit east-southeastward of the cannery, and anchor as convenient. Anchoring in the shoal water is not recommended due to floating debris and vegetation clogging underwater intakes.

The depths in Drayton Harbor and its entrance are subject to change.

Tides.—The mean range of tide at Blaine is 5.9 feet while the range between mean lower low water and mean higher high water is 9.5 feet.

Currents.—The velocity of the current in Drayton Harbor entrance is 1.0 knot. The flood sets southeasterly and the ebb northwesterly.

See Appendix for **storm warning display.**

Pilotage is compulsory for all vessels except under coasting trade on the west coast of the United States, including Alaska and British Columbia. Pilots may be obtained from the Puget Sound Pilots, Seattle, on short notice.

Customs.—Blaine is a port of entry.

Communication may be had by rail and highway. The United States-Canadian boundary line passes through the northern edge of Blaine.

Chart 6300.—Strait of Georgia, eastern shore (Canada).—Boundary Bay indents the mainland between **Kwomais Point,** the northern entrance point of Semiahmoo Bay, and Point Roberts. The greater portion of the bay is filled with flats, bare at low water.

Anchorage in 5 fathoms with good holding bottom is available about a mile east-northeastward of the southeast point of Point Roberts, affording protection from west and northwesterly storms.

Except for **English Bluff** about 1.5 miles northward of **Boundary Bluff,** the coast northward to Point Grey is low, featureless, and barely discernible from the Strait of Georgia.

Roberts Bank and **Sturgeon Bank** are formed by the alluvial deposits of the Fraser River. These banks dry in patches, and in places extend 4.5 miles offshore. They are steep-to: soundings of 50 fathoms will be found very close to the edge of the bank. Vessels proceeding along the edge of Roberts Bank should not bring the southern extremity of Point Roberts or the edge of the high trees immediately within it to bear more than 114°.

The cooperation of ships' masters is requested to avoid navigating their vessels within 2 miles of Sturgeon Bank. This is in the interest of the fishing industry and the reduction of damage to nets and fishing vessels by ships passing in close proximity to the fishing ground.

Fraser River enters the Strait of Georgia about 10 miles northwestward of Point Roberts.

Caution.—The channels in Fraser River are constantly changing and the aids to navigation which mark them are moved accordingly.

The main entrance to Fraser River is between the two lighted buoys westerly of the light near the outer end of Steveston Jetty.

Steveston on **Lulu Island,** about 0.5 mile eastward of **Garry Point,** the northern entrance point to Fraser River, extends along the bank of the river for about 1 mile. Several canneries and wharves are here.

The tidal **currents** in Fraser River are affected by the weather in the Strait of Georgia, the rains, and the amount of water in the river. In the channel above Garry Point during freshets, the flow, which may be checked by the rise of the tide, is almost continuously toward the mouth of the river. During the freshets the greatest velocity occurs 2 to 3 hours before low water and may amount to 5.5 knots. After the freshets are over, the greatest velocity occurs on the average about 1½ hours before low water and is reduced to 3 or 4 knots. During the low stage of the river there is a flood and ebb on all the larger tides; the flood begins soon after high water and commences first along the bottom.

At New Westminster the flood current is unable to reverse the river current except in the autumn months. The river is seldom frozen over here; loose pieces of ice, which do no damage to shipping, occasionally come down the river.

New Westminster is on the northern bank about 20 miles above the entrance. Several canneries and sawmills are here and a conspicuous grain elevator stands about a mile below the city which now has grown into the expanded Vancouver suburbs. A railroad car ferry operates between Port Mann and Victoria, Vancouver Island.

North Arm is entered by a 10-foot channel, heading from the Strait of Georgia about 0.5 mile southwestward of Point Grey.

Point Grey, the southern entrance point of **Burrard Inlet,** is a rounded bluff forming the western termination of a wooded promontory. The point is very conspicuous from southward. **Point Atkinson,** the northern entrance point of Burrard Inlet, is comparatively steep-to. It is marked by a light, and fog signal.

Tide rips occur frequently off Point Atkinson, caused by the meeting of the tidal currents from Burrard Inlet and Howe Sound.

Spanish Bank extends 0.6 mile northward from the western half of the promontory terminating in Point Grey. The bank, which dries, is composed of hard sand, is steep-to, and its position is indicated by a ripple during strong westerly winds at or near low water.

Vancouver Harbor includes all the tidal waters in Burrard Inlet eastward of a line drawn from Point Grey to Point Atkinson. A secure harbor, available to the largest vessel, is formed between First and Second Narrows, and on its shores is the city of Vancouver, the third largest city of Canada and the commercial metropolis of British Columbia. A U.S. Immigration station is in the city.

The three principal anchorages in Vancouver Harbor are English Bay, the outer anchorage; Vancouver within First Narrows; and Port Moody, at the head of the eastern arm of Burrard Inlet.

Chart 6380.—Strait of Georgia, western shore (Canada).—The coast between East Point and Active Pass should be given a berth of at least 2 miles as it is fringed with dangers.

Belle Chain Islets is a narrow rocky ridge 2 miles long lying parallel with several islets and drying rocks along the northern shore of **Samuel Island.**

Edith Point, the northeastern end of Mayne Island, is almost 3.5 miles northwestward of Winter Point. Foul ground extends about 0.3 mile southeastward from Edith Point. A rocky patch with two heads, each of which covers 4 feet, is about midway between **Edith Point** and the northwestern end of Belle Chain Islets.

Chart 6300.—Salamanca Point, on the southeastern side of **Galiano Island,** is conspicuous from both southeastward and northwestward. The point is rocky and the trees on it grow down nearly to the high-water mark.

Porlier Pass, 12 miles northwestward of Salamanca Point, separates Galiano and **Valdes Islands** and connects **Trincomali Channel** with the Strait of Georgia. The pass has a minimum width of about 800 yards, but the navigable channel is narrow and the tidal currents attain velocities up to 8 knots. Current predictions may be obtained from the Tidal Current Tables. It is advisable to employ a pilot on the first visit to this pass.

Gabriola Pass is between the northwestern end of Valdes Island and Gabriola Island, connecting the northwestern end of **Pylades Channel** to the Strait of Georgia. This pass is not recommended for general navigation but only for those with local knowledge. The velocity of the current in the pass is 4.0 knots, setting eastward on the flood and westward on the ebb. The current may attain a velocity of 8 knots. For daily predictions, the Tidal Current Tables should be consulted.

The outermost danger off Gabriola Pass, **Thrasher Rock,** a detached steep-to rock that dries, is 2.3 miles northeast of the pass entrance. A light is on the rock. Shoreward of it are many rocks and reefs, including **Gabriola Reefs;** caution is essential.

Entrance Island, 0.4 mile northeast of Orlebar Point, the northeasterly point of Gabriola Island, is marked by a light and fog signal. It is the guide to the entrance to **Nanaimo,** a Canadian port of entry. **Fairway Channel,** the easternmost of the channels in the northern approach to Nanaimo, is deep and has a navigable width of 0.8 mile.

Off the entrance to **Nanoose Harbor,** 13 miles northwestward of Entrance Island, there are many islets and reefs and, unless making for Nanoose, the navigator should keep 3 miles offshore until he raises the **Ballenas Islands,** 5.5 miles northwest of the Nanoose Harbor entrance.

Complete details of Canadian ports and features are given in H.O. Pub No. 10, Sailing Directions for British Columbia, published by U.S. Naval Oceanographic Office, and the British Columbia Pilot, Volume I, published by the Canadian Hydrographic Service.

13. PUGET SOUND, WASHINGTON

Chart 6401.—Puget Sound extends nearly 53 miles in a general southerly direction from Point Wilson and then turns southwestward for 30 miles, expanding into numerous inlets and passages, the majority of which are navigable by deep-draft vessels. Admiralty Inlet is the northern portion of the sound from Point Wilson to Foulweather Bluff.

Navigation of this area is comparatively easy in clear weather. The outlying dangers are few and marked by aids, and generally a midchannel course can be followed with safety. The currents follow the general direction of the channels and have considerable velocity. In thick weather, owing to the uncertainty of the currents and the great depths which render soundings useless in many places, strangers are advised to take a pilot.

Anchorages.—General, explosives, and foul weather anchorages have been established; limits and regulations are given in **202.230,** Chapter 2.

Dangers.—Restricted areas have been established; limits and regulations are given in **207.750,** Chapter 2.

The large tides of Puget Sound are very complex and variable; use of the Tide Tables is advised.

Currents.—Daily predictions are given in the Tidal Current Tables. The Tidal Current Charts, Puget Sound, Northern Part, show the direction and velocity of the tidal current for each hour of its cycle in the waterways of Puget Sound from Admiralty Inlet to Seattle. They are designed for use with the current predictions for Admiralty Inlet contained in the Tidal Current Tables. A similar publication, entitled Tidal Current Charts, Puget Sound, Southern Part, covers the sound from Seattle to Olympia.

In Admiralty Inlet and Puget Sound, the tidal currents are subjected to daily inequalities similar to those of the tides. Velocities of 2 to 5 knots occur from Point Wilson to Point No Point. In the more open waters of the sound southward of Point No Point the velocities are much less.

At Point Wilson and at Marrowstone Point, slack water occurs from one-half to one hour earlier near shore than in midchannel.

In the winter, when southerly winds prevail, there is generally a northerly surface drift which increases the ebb current and decreases the flood current. This effect is about 0.5 knot between Nodule and Bush Points.

The tidal currents in the southern entrance of Possession Sound are weak and variable.

Between Foulweather Bluff and Misery Point, the tidal currents have a velocity of about 0.8 knot, while in the southern part of Hood Canal, the velocity is only about 0.5 knot; at times of tropic tides, however, the greater ebbs may attain velocities more than double these values.

The tidal currents have velocities up to 6 knots or more in Agate Passage.

Chart 6405.—Port Townsend, immediately southward of Point Wilson, is entered between Point Hudson and Marrowstone Point. It extends in a general south-southwesterly direction for 2.5 miles, and then turns southeastward for 3 miles, with a reduced width to its head. Inside Point Hudson, the depths range from 15 fathoms to 8 fathoms off Hadlock at the head of the bay. It is an excellent harbor with good anchorage throughout, and is easily entered. The prevailing winds in summer are from west to southwest, and in winter are generally in the southeastern quadrant.

The large pulpmill at Port Townsend emits a continuous yellowish smoke, which acts like fog but is more persistent. At times the visibility in Admiralty Inlet is reduced to about 0.5 mile by the smoke as far north and west as Dungeness with easterly winds, and as far south as Double Bluff with westerly winds. The smoke has a characteristic sulphurous odor. Visibility is particularly reduced when natural fog occurs at the same time.

Point Hudson, on the western shore 1.7 miles south-southeastward of Point Wilson, is low and sandy. It is marked by a light and fog signal. The outer limits of the shoal making out from the point are marked by a buoy northeasterly of the light.

Marrowstone Point, the eastern point at the entrance to Port Townsend, is low at its extremity but rises abruptly to a bluff about 120 feet high. The buildings of the former Fort Flagler, now a recreation area of the Washington State Parks system, are about 0.5 mile to the south. A pier, with depths of 20 feet alongside, extends out abreast of the buildings. **Marrowstone Point Light (48°06.1′ N., 122°41.2′ W.),** 28 feet above the water, is shown from a 20-foot white square structure on the eastern edge of the point; a fog signal is at the light. Piling of former piers extend up to 500 yards offshore 0.6 and 1.6 miles westward of the light.

Midchannel Bank, covered 4½ to 10 fathoms, extends northwestward from Marrowstone Point about 2 miles toward Point Wilson.

Port Townsend, the principal town, is on the western shore southward and westward of Point Hudson. The depths at the wharves range from 12 to 20 feet along the faces.

Anchorage.—The usual anchorage is about 0.5 to 0.7 mile southward of the ferry landing in 8 to 10 fathoms, muddy bottom, or off the wharves. In southerly gales better anchorage is afforded closer inshore off the northern end of Marrowstone Island or near the head of the bay

in moderate depths, muddy bottom. Two explosive anchorages are in the bay; limits and regulations are given in **202.230,** Chapter 2.

A basin 10 feet deep for small boats is maintained by the Port of Port Townsend, 1 mile southwestward of Point Hudson. There are lights at the entrance. Another small-craft basin is just west of Point Hudson.

Tides.—The mean range of tide at Port Townsend is 5.1 feet. The range between mean lower low water and higher high water is 8.3 feet. Because of the large daily inequality in this vicinity there may be only one high water and one low water a day. Reference should be made to the Tide Tables which give daily tide predictions for Port Townsend.

See Appendix for **storm warning display.**

Pilots for Puget Sound are available at Port Angeles.

Towage.—There are no large tugboats stationed at Port Townsend, but they may be obtained from Seattle or other sound ports.

Quarantine.—There is an outpatient office of the U.S. Public Health Service in Port Townsend.

Customs.—Port Townsend is a port of entry; marine documents are issued. The customs officer also handles **immigration** matters.

Supplies.—Provisions and marine hardware can be obtained; water is available at the wharves. Fuel oil is supplied in limited quantities, and gasoline and diesel oil are pumped at several oil wharves.

Repairs.—There are no drydocks, and minor repairs only can be made. There are facilities for hauling out launches and fishing boats up to 300 tons. The Port of Port Townsend maintains major facilities in the harbor, including the small-craft haven, and in Mystery Bay on Marrowstone Island is a small-boat float where gasoline and water may be obtained.

The marina on Point Hudson has a mobile hoist capable of lifting out craft up to 24 tons for general repairs.

Communications.—A passenger and automobile ferry operates the year around between Port Townsend and Keystone Harbor, just eastward of Admiralty Head, Whidbey Island. There are rail and bus connections with Port Angeles. Port Townsend is on the Olympic Loop Highway, which encircles the Olympic Peninsula.

Glen Cove, about 2.2 miles southwestward of Point Hudson, is the site of a large papermill with a wharf for deep-draft vessels, at the northern end of the cove. It is the principal industry here. An area surrounding the wharf and extending to deep water has been dredged to 30 feet. A lighted range for approaching the wharf and a fog signal are maintained by the mill. The large white building and tall stacks of the mill are prominent, as is the smoke.

Irondale, on the western shore about a mile from the head of the bay, is the site of a former iron foundry. Shoal water extends 0.2 mile from the shore at this place. Log booms extend northward 0.8 mile to **Kala Point** which is marked by a light.

Hadlock, a village at the head of the harbor, has landings with depths of 10 and 12 feet. Submerged pilings are nearby; local knowledge is necessary to avoid them.

Port Townsend Canal, a dredged passage giving access to Oak Bay to the southeast, is subject to considerable shoaling. The Federal project depth is 15 feet, which is usually maintained. The southern entrance is jettied, and lights are at both entrances.

Currents through the canal are strong at times, although there is no particular danger from them as the channel is wide and straight; there are, however, strong eddies at the south end on the ebb current.

The canal is crossed by a fixed highway bridge with a clearance of 58 feet. Power cables nearby have clearances of 90 feet. Rules and regulations for use of the canal are given in **207.750,** Chapter 2.

Kilisut Harbor, between **Indian Island** on the west and **Marrowstone Island** on the east, is a narrow inlet extending about 4 miles in a south-southeasterly direction. The entrance is about 2.5 miles southwestward of Marrowstone Point. The entrance channel is winding, with a least depth of about 11 feet; inside there is good anchorage in 4 to 5 fathoms. At the southern end of the harbor the two islands are connected by an earth-filled causeway and narrow strip of beach. The village of **Nordland** is on the eastern side of **Mystery Bay,** a small shallow cove midway on the eastern side of Kilisut Harbor. A small-craft float is here; gasoline and water are available. The head of the cove is used as a log dump.

Chart 6450.—Admiralty Inlet extends from the Strait of Juan de Fuca to Foulweather Bluff.

Admiralty Bay, eastward of Admiralty Head described in the previous chapter, is used only occasionally as an anchorage as it is exposed to southwesters and has hard bottom and strong currents. **Keystone Harbor,** an improved part of **Lake Crockett,** lies just northeastward of Admiralty Head. The project channel into the ferry landing has a controlling depth of about 18 feet. Jetties protect the entrance; some shoaling occurs at the edges. The ferry hauls vehicles and passengers between Keystone and Port Townsend. A concrete launching ramp is nearby.

Bush Point, 8 miles south-southeastward of Admiralty Head, is marked by a light and fog signal at the end of a low sandspit. Back of the spit the land shows as a low timbered point from northward or southward. The flood current is reported to set strongly toward Bush Point. Tidal Current Charts for this area should be consulted. Several rocks lie nearly 0.2 mile offshore 1.1 miles southeastward of Bush Point.

Oak Bay is a cove on the western side of Admiralty Inlet, westward of the southern ends of Marrowstone and Indian Islands. A shoal which extends southward of the eastern entrance point is marked by a buoy.

Mutiny Bay, between Bush Point and Double Bluff, affords temporary anchorage near the center in 10 to 20 fathoms; useful if overtaken by fog. The extremities are clay bluff; the center is low with extensive flats. There are several sport fishing resorts, some equipped with marine railways for launching small boats. Petroleum products, fishing supplies, and groceries are available. Strong tide rips, at times dangerous for small boats, occur off Double Bluff, particularly on the ebb with strong north-

westerly winds. There is frequently an eddy in Mutiny Bay; tidal current charts should be consulted.

Double Bluff, marked by a light and fog signal, consists of bare, white cliffs, 300 to 400 feet high on its eastern face, but much lower on its southwesterly face. A lighted buoy marks the extremity of the shoals 600 yards westward of the bluff. The shoals are usually marked by kelp.

Chart 6421.—Foulweather Bluff, on the east side of the entrance to Hood Canal, is one of the most prominent cliffs in Puget Sound. The northern face, which is bare, is 0.5 mile broad and consists of vertical, grayish sand and clay bluffs, 225 feet high, sloping off on the eastern side to a bluff 40 feet high, but on the Hood Canal side the point is steep and high. The top of the bluff is fir and underbrush. There are several boulders which bare within 100 yards northward of the highest part of the bluff, and a shoal covered 2 to 18 feet extends 200 yards eastward from the extremity and in line with the face of the bluff. If overtaken by fog, a vessel can find temporary anchorage 0.5 mile northward of Foulweather Bluff, in not less than 60 feet. A lighted buoy marks the shoal 0.4 mile northerly of the bluff.

At times there are tide rips northward of and around Foulweather Bluff sufficiently heavy to be dangerous to small craft and to break up log rafts. This is most dangerous when the ebb current from the main body of Puget Sound meets that of Hood Canal off the point, and particularly so with the ebb against a strong northerly or northwesterly wind.

The entrance to **Port Ludlow,** in the western part of Admiralty Inlet, lies 9 miles southward of Marrowstone Point and on the west side at the entrance to Hood Canal. From the broad entrance the bay extends in a general southerly direction 2.5 miles, terminating in a basin 0.5 mile in diameter. The basin affords good anchorage in 40 to 50 feet, soft bottom; the shores are fairly steep.

Tala Point, the eastern point at the entrance, is bluff and wooded, and about 310 feet high. The three **Colvos Rocks** are 1.2 miles northwestward of Tala Point and about 0.3 mile off the western shore; the westernmost rock, 25 feet high and of small extent with deep water around it, is marked by a light. From the other two a bank covered by 7 to 28 feet extends to Tala Point.

Snake Rock is 0.4 mile southwestward of the western Colvos Rock and 300 yards offshore.

Klas Rock, 0.2 mile from the western shore abreast the narrow entrance to **Mats Mats,** a small lagoon, is of small extent and is awash at high water. The rock, marked by kelp, is surrounded by deep water with depths up to 100 feet between it and the shore.

The entrance to Mats Mats is approximately 100 yards wide at high water. A rock that bares lies slightly northward of midchannel about 200 yards inside the entrance. A rock quarry is in the small cove on the east side of the lagoon at Mats Mats, from which barges of rock and gravel are towed to Puget Sound ports. Small vessels and pleasure craft use Mats Mats as an anchorage which is practically landlocked and protected from wind. There is a float extending from the south shore, but there are no service facilities. Entrance to the cove should not be attempted except with local knowledge and preferably at high tide, favoring the south shore of the entrance and making the turn toward the south with extreme caution.

Port Ludlow, a "ghost town" in the maritime sense, has no residents, no more lumber trade, and no facilities. Only piling remain of the old municipal wharf, except for the concrete apron and base of the former powerhouse. The only activity remaining is the log dumping at the head of the bay.

At the extreme southwestern portion of Port Ludlow are two islands known as **The Twins.** The small bay south of The Twins is sometimes used as an anchorage for small craft in rough weather.

Chart 6450.—Useless Bay, in Whidbey Island eastward of Double Bluff, is open to the southwestward. The shores are bluff and low, with a fringe of marsh nearly around the bay.

Hansville, about 2.5 miles eastward of Foulweather Bluff, is a small village with stores and a small-craft marina. The wharf, about 150 feet long, has float moorings. Gasoline, lubricants, ice, water, and some groceries are available. Minor repairs can be made to outboard motors.

Norwegian Point, low and rounding, lies about 0.2 mile northwestward of Hansville. About a mile west of Hansville is a conspicuous private structure with a top closely resembling a lighthouse.

Point No Point, on the western shore of the sound about 3.5 miles eastward of Foulweather Bluff, is a low sandspit. **Point No Point Light (47°54.7′ N., 122°31.5′ W.),** 23 feet above the water, is shown from a white 27-foot square tower on the end of the point; a fog signal is at the station.

Scatchet Head and **Possession Point,** at the southern end of Whidbey Island, are both prominent, especially from southward, the white bluffs being visible for a considerable distance. A lighted bell buoy is 0.4 mile southward of the point. Shoals extend 0.5 mile offshore immediately westward of Scatchet Head and over 0.2 mile offshore from the head to Possession Point. **Cultus Bay,** just west of Possession Point, bares completely at low water. Possession Sound and tributaries are described later.

Chart 6445.—Apple Cove Point is a low sandspit projecting 220 yards from the high, wooded land of the peninsula. The point is steep-to, but a shoal makes out nearly 0.5 mile southeastward from it. Just off the point is **Apple Cove Point Light (47°48.9′ N., 122°28.8′ W.),** 18 feet above the water, shown from a white platform on a dolphin. Heavy tide rips caused by strong northwesterly winds and a strong ebb current are encountered in the vicinity of the light.

Appletree Cove is the open bight on the western side of the sound about 1.5 miles southward of Apple Cove Point. It affords anchorage in 30 to 60 feet inside the

line of the entrance points, with some shelter from winds drawing in or out of the sound, but not from northward and southeastward.

Kingston, a town on the northern side of the cove, has a combination landing wharf and ferry slip. The ferry runs between Kingston and Edmonds.

There is an electric powerplant with a prominent lighted sign about 3.2 miles southward from Apple Cove Point and just southward of **President Point.** Shoals extend over 0.2 mile from the powerplant.

Edwards Point is a high, wooded point on the eastern side of Puget Sound 8.3 miles east-southeastward of Point No Point. It is a turning point for vessels running from Seattle northward into Possession Sound and adjoining waters. A large oil storage and distributing plant is on this point. With its many large tanks on and below the bluff, the point is prominent from seaward. A wharf with a 256-foot berthing face extends to deep water. Dock lights, a lighted sign, and a fog signal are maintained by private interests on the wharf. Petroleum products in any quantity may be obtained.

Edmonds, an incorporated city a mile northeastward of Edwards Point, has a small-craft harbor and marina under the administration of the **Port of Edmonds.** This marina has storage, open and covered, for some 400 boats up to 50 feet in length. Gasoline, water, and other services are provided. In 1962, the principal building was nearing completion to house the concessionnaires who will handle supplies, hardware, and make repairs. There are three lifts at the marina. There also are boat service places between the port harbor and the ferry building.

The ferry operates between Edmonds and Kingston.

Point Wells is a low, sandy point projecting 450 yards from the high land about 1.2 miles southward of Edwards Point on the east side of the sound. It is distinguished by prominent oil tanks. It is a water terminal and storage plant for a large oil company. There is berthing space for several large vessels, and ample depths of water alongside both wharves. Northward and southward of these wharves shoals extend well offshore and care should be taken to avoid the shoal water when coming alongside or leaving the wharves. The lighted range on the point is used to clear the shoals northward of the wharves. A private fog signal is on the southerly wharf.

Port Madison indents the western shore between the north end of Bainbridge Island and **Point Jefferson.** It is about 2.5 miles in length and deep; not until within 0.5 mile of the beach can anchorage be found in 90 or 100 feet, sticky bottom. Its southwestern part connects with Port Orchard through Agate Passage.

A **naval restricted area** marked by buoys is eastward of Point Jefferson; limits and regulations are given in **207.750,** Chapter 2.

An **explosives anchorage** is 1 mile westward of Point Jefferson in the northeastern part of Port Madison; limits and regulations are given in **202.230,** Chapter 2.

The northern shore is formed by broken white bluffs, with low beaches between, and bordered by sand and shingle beaches that bare in some cases as much as 0.2 mile off. The bluffs on the western shore are moderately low; the buildings of the Indian reservation near the entrance to Agate Passage are prominent. **Indianola,** a village on the northern shore, has a store and service station. Care must be taken in going to or from this place because of the shallow water just eastward of the outer end of the wharf.

Miller Bay, in the northwestern part of Port Madison, is used by shallow-draft pleasure craft. The channel, privately marked, should not be used at low tide because of the very irregular bottom. Anchorage in 6 to 7 feet, sticky mud bottom, may be had north of the second buoy. The controlling depth to this anchorage is about 1½ feet.

Point Monroe, the southern point at the entrance of Port Madison, is a low, narrow sandspit, curving westward and southward and marked by a light and fog signal. A small cove is between the sandspit and the shore to the southward. The entrance dries at low water.

The southern shore of Port Madison is composed of broken bluffs, except where it is indented by the narrow arm extending a mile southward.

The entrance to the Port Madison inlet is 0.7 mile westward of Point Monroe Light. The town is a popular summer resort with many cottages along its shores. There are moorings for visiting yachts, but no facilities for fueling. The narrow channel has a least depth of 14 feet, and local knowledge is necessary to keep in the best water. An old ballast dump, nearly bare at low water, lies 75 yards offshore 400 yards in from the eastern entrance point. Care should be taken to avoid the cluster of covered rocks 100 yards off the eastern entrance point. There are several landings for launches in the inlet. Sheltered anchorage for small craft may be had in up to 21 feet, mud bottom.

Meadow Point, on the eastern side of Puget Sound nearly opposite Point Monroe, is a low, grassy point, with a marshy lagoon within, and higher ground behind it. The city of Seattle maintains a bathing beach just southward of the point.

Chart 6446.—Murden Cove is an open bight on the western side of the sound about 3 miles southward of Point Monroe. An extensive flat which bares extends almost 0.5 mile from the head of the cove and outside of it the depth increases rapidly to 60 feet. **Skiff Point,** the northern entrance point, has low yellow bluffs to the southward. A shoal extends about 250 yards from the point, this shoal is reported to be building out and should, therefore, be given a wide berth. **Yeomalt Point,** the southern entrance point, is a low grassy sandspit, 150 yards wide, rising gradually to the general level of the high land.

Wing Point, on the northern side of the entrance to Eagle Harbor, is a narrow, bluff point 30 feet high, covered with trees to the edge. A reef extends southeastward for 0.5 mile from Wing Point and is generally marked by kelp. The extremity of the reef is marked by a buoy. **Tyee Shoal,** 0.6 mile southeastward of Wing Point, with a least depth of 15 feet, is marked by a lighted bell buoy.

Foul ground extends as much as 500 yards off the

southern point at the entrance; buoys mark its outer limits.

Eagle Harbor indents the eastern shore of Bainbridge Island, 5 miles southward of Point Monroe and opposite Elliott Bay. It is a mile long, and affords excellent anchorage in 30 to 36 feet, muddy bottom. It narrows at the head to 300 yards.

The entrance is deep but caution is necessary in entering because the channel is only 200 yards wide between the reef south of Wing Point and the spit on the west side of the channel entrance. The channel is marked by lights and buoys.

Winslow is the largest town on Eagle Harbor. It is on the northern shore, and is a major ferry port on the routes out of Seattle to the westward. About 0.3 mile west of the ferry slip is a marina where small-craft moorings, supplies, limited engine repairs, gasoline, lubricants, water, ice, and groceries are available.

The former shipyard has been abandoned.

Creosote, a town on the southern side of the entrance to Eagle Harbor, has a large creosoting plant. The main wharf has depths of 14 to 33 feet along the southern face. Fresh water is available. A light and fog signal are on a white house on a dolphin, eastward of the town, in 14 feet of water. Large quantities of creosoted lumber and pilings are shipped from Creosote to foreign and domestic ports. **Eagledale,** a small hamlet on the southern shore about 0.5 mile westward of Creosote, has a landing wharf built out to 10 feet.

Blakely Rock, the highest of four rocks, is prominent in approaching Blakely Harbor; it lies 0.8 mile northward of Restoration Point, and at high water shows about 15 feet at its highest point. It is 300 yards in extent, with shoal water, well marked by kelp, extending over 250 yards northward. A light is on the south side of the rock.

Blakely Harbor is a small inlet on the eastern shore of Bainbridge Island near its southern end. It is a mile in length. Depths range from 108 feet at the entrance to 21 feet near the head. The usual anchorage is near the entrance in 54 to 96 feet, sticky bottom, slightly favoring the southern shore. There are many old pilings and dolphins in the shoal waters near the shores. There are no usable wharves in Blakely Harbor.

Restoration Point is flat and about 10 feet high for 300 yards from the shore, then it rises abruptly to a wooded knoll about 100 feet high, on which a number of large buildings are prominent. **Decatur Reef,** partly bare, extends 300 yards eastward of Restoration Point. The outer end of the reef is marked by a lighted horn buoy.

Chart 6449.—Shilshole Bay lies between Meadow Point and West Point. It is an open bight from which the Lake Washington Ship Canal is entered, and is the site of one of the largest and most important small-craft marinas in the Seattle area. Southward of the canal entrance, clay cliffs extend for about 0.5 mile.

Shilshole Bay Marina, the small-craft basin just north of the canal entrance, is administered by the Port of Seattle. Its capacity of 875 berths was being enlarged in 1962 to accommodate nearly twice that many. Federal project depth is 15 feet in the south entrance and that depth to about the midway point, above which it is 10 feet. The north entrance has a controlling depth of 15 feet. The central terminal building provides supplies and hardware. The two service piers offer fuels, lubricants, water, parts, and ice. There is a concrete launching ramp for trailer-drawn boats, and parking space for 1,200 autos.

West Point, at the northern entrance to Elliott Bay, is a low, sandy point which rises abruptly to an elevation of over 300 feet half a mile from its tip. The edge of the shoal extending southwestward from the point is marked by a buoy. **West Point Light (47°39.7′ N., 122°26.1′ W.),** 27 feet above the water, is shown from a white square tower on the end of the point; a fog signal and radiobeacon are at the station.

Alki Point, at the southern entrance to Elliott Bay, is low with a small prominent wooded knoll about 80 feet high immediately back of it. Eastward of the knoll, lowland extends for nearly 0.4 mile before rising to the high land extending southward from Duwamish Head. **Alki Point Light (47°34.6′ N., 122°25.2′ W.),** 39 feet above the water, is shown from a white octagonal tower attached to a building on the end of the point; a fog signal is at the station.

Elliott Bay indents the eastern shore of Puget Sound about 35 miles south-southeastward of Marrowstone Point. The entrance is between West Point on the north and Alki Point 5 miles southward. The bay proper, lying east of a line between Magnolia Bluff and Duwamish Head, has a width of over 2 miles and extends east-southeastward for nearly the same distance. The bay is deep and free from dangers throughout.

Magnolia Bluff, largely bare, light-colored, and rising in places to nearly 300 feet, extends along the northern shore from West Point to Smith Cove. **Fourmile Rock** is 60 yards offshore, 1.7 miles southeastward of West Point Light. A light and fog signal are on the rock.

Seattle, the largest and most important city in the Northwest and one of the major ports of the Pacific Coast, extends as a greater metropolitan area from Everett, the city on its north, almost to Tacoma, the major city to the south. This area is thickly populated, not only in that north-south dimension but also eastward beyond the limits of Lake Washington and its shores.

Much of Seattle's shipping is in the oriental trade, and the city itself has grown into a major industrial center. Seattle handles most of the waterborne commerce to Alaska points, and is the terminus of several shipping lines operating to Alaska as well as all parts of the world.

Prominent features.—In clear weather the skyline of Seattle itself is unmistakable. From north to south, the conspicuous features are: the "space needle", a legacy from the 1962 Fair; the Washington Building, of light sandstone usually illuminated at night; the Northern Life Tower, the lighted "C L" sign, the Exchange and Norton Buildings, and the Smith Building, whose pointed tower was the tallest until erection of the space needle. From several miles off, the space needle is easily the most iden-

tifiable object. When closer in, the big "PORT OF SEATTLE" sign on that commission's building is very conspicuous.

The Port of Seattle includes an outer and inner harbor. The outer, salt-water, harbor includes Elliott Bay; East, West, and Duwamish Waterways; Shilshole Bay, and the portions of Puget Sound adjacent to Ballard on the north and West Seattle to the south of the entrance to Elliott Bay. Seattle's fresh-water inner harbor consists of Lakes Union and Washington which are connected with each other and with Puget Sound by the Lake Washington Ship Canal.

The entrance to **East Waterway** is marked by a light and fog signal on the western side of the entrance. The waterway has many modern terminals including grain elevators, cold-storage plants, fuel- and vegetable-oil storage, and general cargo docks. Large vessels in foreign and intercoastal trades berth and load in this waterway. Depths alongside the principal terminals range from 24 to 40 feet.

The entrance to **West Waterway** is marked by a light and fog signal. There are several terminals and docks in this waterway, most of which are used in the private business of their operators and are not open to the public. Depths alongside the major facilities range from 27 to 38 feet. At the northwestern corner of Harbor Island is a large shipyard operating four drydocks. Regulations for the waterway are given in **207.750,** Chapter 2.

Duwamish Waterway, extending southerly from West Waterway, is fronted by factories and industrial plants for more than 4 miles. These facilities are served by vessels and barges; depths alongside the terminals are 6 to 30 feet.

Channels.—Depths of 34 feet or more are available to the Seattle waterfront in Elliott Bay. Project depth of 34 feet in East and West Waterways is generally maintained. In 1962, the controlling depths in Duwamish Waterway were 27 feet to the First Avenue South Bridge, and thence 14 to 12 feet to Fourteenth Avenue South Bridge; below this bridge, depths were 6 feet or less.

Anchorages.—Anchorage is plentiful within the limits of the areas defined in **202.230,** Chapter 2. In general, Elliott Bay is so deep and swinging room so limited that vessels seldom anchor, but prefer to go directly to their wharves. During heavy northerly weather, which is rare but does visit during the winter, anchorage in the bay becomes uncomfortable. The city of Seattle maintains mooring buoys and floats.

Bridges.—There are no bridges over the Seattle waterfront in Elliott Bay, and none over East and West Waterways. The 4.5-mile Duwamish Waterway is crossed by four bascule bridges with clearances of 7 to 27 feet; drawspan regulations are given in **203.790,** Chapter 2. The power cables in this section have a least clearance of 90 feet.

Tides at Seattle have a mean range of 7.6 feet. The range between mean lower low water and mean higher high water is 11.3 feet. A range of about 18 feet may occur at the time of maximum tides. Daily tide predictions for Seattle are given in the Tide Tables.

As a rule, the tidal **currents** in the harbor have little velocity. At times, however, with a falling tide an appreciable current will be found setting northwestward along the waterfront.

See Appendix for **storm warning displays.**

Routes.—Vessels bound for the Strait of Georgia from Seattle can use the following routes: **via Rosario Strait**—a midchannel course through Puget Sound and Admiralty Inlet, thence east of Partridge Bank, Smith Island, Davidson Rock, Belle Rock, Peapod Rocks, Clark Island, and thence between Sucia Islands and Alden Bank to the Strait of Georgia; **via Haro Strait**—from Admiralty Inlet, thence west of Partridge Bank and east of Hein Bank, thence through Haro Strait and Boundary Pass to the Strait of Georgia.

These routes are available for vessels of any draft in clear weather. In thick weather, strangers are advised to take a pilot. A range should be steered where available so as to insure making the courses good.

Between Admiralty Inlet and the entrance to Rosario Strait, the current on the flood has a tendency to set a vessel eastward toward Whidbey Island; it also sets strongly through Deception Pass and up Rosario Strait. Through Rosario Strait the currents run with considerable velocity. Heavy tide rips and swirls are found off Black Rock, Obstruction Pass, Peapod Rocks, and Lawrence Point.

In crossing from Admiralty Inlet to the entrance of Haro Strait, the tidal currents setting to and from Rosario Strait and San Juan Channel, with estimated velocities of 2 to 3 knots, should be kept in mind. From Henry Island to around Turn Point, heavy tide rips are found on the ebb. Particularly heavy and dangerous tide rips occur on the ebb between East Point and Patos Island and for 2 miles northward in the Strait of Georgia. The flood from Rosario Strait, which is felt as soon as the passage between Orcas and Sucia Islands is open, is apt to set a vessel toward East Point. The ebb in this vicinity sets to the eastward even before the Strait of Georgia is well open.

Pilotage.—Licensed pilots can be obtained for Puget Sound or for the inside passage to Alaska from the Puget Sound Pilots office, Exchange Building, Seattle. The Pilot Station is at Port Angeles; see Chapter 12 for details.

Towage.—Tugboats ranging in size from 15 to 1,500 horsepower are available in Seattle.

Quarantine.—Vessels subject to quarantine usually proceed to their docks where they are boarded for inspection. Any vessel having on board suspected quarantinable or communicable diseases is required to make radio report to the quarantine office. The quarantine anchorage is just northward of Harbor Island. Fumigation with cyanide can be arranged for in Seattle. A U.S. Public Health Service hospital is in the city.

Customs.—Seattle is headquarters of the customs collection district and a port of entry; marine documents are issued.

Immigration officials are stationed at Seattle.

Harbor regulations are enforced by a port warden of the city of Seattle Harbor Department, who also is Chief

of the Fire Department.

Harbor Patrol.—The Seattle Police Harbor Patrol has two powerful patrol boats and a pontoon-equipped helicopter to give force to the city ordinance prohibiting unlawful destruction by excessive speeds, disorderly behavior, or unsafe seamanship. They maintain constant radio contact with each other and the police "land cruisers" on 24-hour patrol.

Wharves.—An extensive system of wharves, both municipal and private, are here; some are equipped with the most modern facilities for rapid handling of cargo. The Port of Seattle operates some of the principal terminals, administers others, and leases some to their present users. An expansion program was underway in 1962, mainly in the East and West Waterways, to increase berthage and facilities. Most of these wharves are equipped with modern machinery and devices to handle the cargo passing through this port, such as lumber, grain, fish, oil and tallow, dairy products, and petroleum products.

Supplies can be obtained in any quantity.

Repairs are made to all kinds of hulls and machinery. There are numerous shipbuilding and repair yards with drydocks or marine railways of various sizes. The largest drydock available is 600 feet long, 110 feet wide inside, with a depth over the keel blocks of 30 feet. It is of the floating sectional type, with a lifting capacity of 20,000 tons. There are larger drydocks at the Puget Sound Naval Shipyard in Bremerton, available for private use under certain conditions when not required by the Government.

Small-craft facilities.—The principal facilities for small craft include the Shilshole Bay Marina, previously described; the many service and repair places in the Lake Washington Ship Canal and Union Bay; the yacht clubs and small-boat bases in Portage Bay, and the countless docks and facilities for small craft in Lake Washington itself.

Communications.—Rail, truck, and air lines fan out from Seattle to all parts of the country, and the city is a port of call for many steamship lines from all over the world as well as the intercoastal carriers. The port is the major one for Alaskan commerce, both by vessel and aircraft. There are complete radio facilities, including two-way radiotelephone communication between ships in and near the harbor and points on the land-line networks.

Chart 690–SC.—Lake Washington Ship Canal extends from Puget Sound through Shilshole Bay, Salmon Bay, Lake Union, Portage Bay, and Union Bay to deep water in Lake Washington. Federal project depth through the canal is 30 feet, which is generally maintained.

There is a double lock and fixed dam at the narrows of the entrance to Salmon Bay, 1.2 miles in from the sound. The large lock has clear length of 760 feet, width of 80 feet, lift of 26 feet, and depth over the lower miter sill of 29 feet. The small lock has clear length of 123 feet, width of 30 feet, lift of 26 feet, and depth over the lower sill of 16 feet. Passage time is less than 30 minutes for large vessels and 5 to 10 minutes for small ones.

Navigation regulations for the canal are given in **207.750,** Chapter 2.

From **Salmon Bay** the canal leads eastward through a narrow channel to **Lake Union,** a widening that extends a mile southerly. There are many piers and wharves, and several railways for repair yards, in this bay; some of the facilities are for transshipment of lumber, fuel, and certain industrial products.

Portage Bay, eastward of Lake Union, is the site of two major yacht clubs and many slips and finger piers for small craft.

The land cut from Portage Bay leads past the conspicuous buildings and athletic stadium of **University of Washington,** on the north side, thence into **Union Bay,** and thence into Lake Washington.

Lake Washington Ship Canal is crossed by six bascule bridges and two fixed bridges. Clearances of the drawspans are 16 to 43 feet; see **203.795,** Chapter 2, for operating regulations. The fixed bridges have a least clearance of 128 feet. Cables crossing the canal have a least clearance of 155 feet.

Chart 6449.—Lake Washington, the large fresh-water lake on Seattle's east side, provides deep and protected water over most of its length of nearly 16 miles. Its shores are studded with piers and landings, nearly all of which are private, and there are marinas and small-craft repair places at many locations.

There are few commercial installations, the principal one being at **Port Quendall** on the eastern side, opposite the southern end of Mercer Island. Here there is a lumber mill and creosoting plant; extensive storage of logs is done here as well as at the northerly end of the lake.

Measured courses are established along the pontoon bridge to Mercer Island. The markers, on course **091°55′,** indicate both a nautical-mile course and a half-mile course, the latter to serve yachtsmen interested in high-speed checks. The targets are painted on both sides of the bridge so that the courses can be run either north or south of the bridge.

The pontoon bridge crossing the lake between **East Seattle** on the north end of Mercer Island and the city proper has a floating drawspan, 500 yards east of the island; see **203.800,** Chapter 2, for operating regulations. Closer inshore on each side are fixed spans with clearances of 30 feet. The fixed bridge on the east side of Mercer Island, from **Barnabie Point** to the mainland, has clearance of 38 feet.

In 1962, another pontoon bridge was under construction, from Union Bay to Fairweather Point.

Houghton, at the northeastern side of the lake just south of Kirkland, is the site of a former shipyard. There are several oil piers in this area and several marinas catering to yachtsmen.

Juanita Bay, northward of Kirkland, is a summer recreational area with several small piers.

The Naval Air Station at **Sand Point** is on the western shore of the lake just northeastward of Union Bay. A **prohibited area,** reserved for seaplane landings, and

marked by special buoys, is 1.5 miles northward of Sand Point; see **207.750,** Chapter 2, for limits and regulations.

Chart 6450.—Possession Sound joins Puget Sound at the southern point of Whidbey Island and extends in a general northerly direction for 10 miles to its junction with Saratoga Passage and Port Susan. From the entrance it extends for 3.5 miles with an average width of 2 miles, and then expands into an irregular basin about 6 miles in diameter.

The eastern part of this basin is filled with extensive flats, many of which uncover and rise abruptly from deep water. These flats are intersected by several shifting channels, forming the mouth of the Snohomish River. The waters of the sound are generally deep, and the only anchorage used by large vessels is off the town of Everett, close inshore, in 10 to 15 fathoms.

Meadowdale, known locally as **Haines Wharf** or **Browns Bay,** is the residential area on the eastern side of the sound about 4 miles southward of Possession Point. There are two piers, the longest of which, 150 feet in length, has gasoline, ice, water, and fishing supplies.

Glendale is a village on the west side of the sound 2.2 miles northward of Possession Point. Gasoline, lubricants, groceries, and fishing supplies may be obtained. There are accommodations for transients during the summer season.

Chart 6448.—Elliot Point, on the eastern side of Possession Sound 4 miles northeastward of Possession Point, is a low spit projecting some 200 yards from the high land. **Mukilteo Light (47°56.9′ N., 122°18.3′ W.),** 33 feet above the water, is shown from a white square tower on the point; a fog signal is at the station.

Mukilteo is a town eastward of Elliot Point. An automobile ferry runs between Mukilteo and Clinton on Whidbey Island. A Government wharf for deep-draft vessels is 0.4 mile eastward of Mukilteo Light.

There are small-craft facilities at Mukilteo, including launching railways and ramps, gasoline and lubricants, fishing supplies, and limited repairs to outboard engines.

Gedney Island, known locally as **Hat Island,** is 3.5 miles northward of Elliot Point. It is about 1.5 miles long in an easterly direction, is high, wooded, and prominent. From its eastern point a shoal extends eastward, the 5-fathom curve being at a distance of 0.8 mile. Foul ground extends 0.2 mile from the south side of the eastern half of the island.

A tug with tow passing through the restricted fishing area northeast, east, and southeast of Gedney Island occupied by gill net gear is required to sound one long blast, followed by two short blasts, of a whistle or horn, and during darkness or fog must in addition, indicate its intended course by directing a searchlight beam on such course.

Clinton, a village on **Randall Point,** is the Whidbey Island terminus of the ferry from Mukilteo. Clinton has several stores, and a wharf with 15 feet reported at its outer end. It has a float for small craft. Gasoline and oil are available and minor repairs to pleasure craft can be made.

Everett, an important lumber and pulp shipping port, is on the east side of **Port Gardner,** 4 miles northeastward of Elliot Point. The several tall stacks and pulpmill chimneys in the town are prominent.

Channels.—Depths of 28 feet or more are available to the main wharves in Port Gardner. A channel marked by some lights and buoys extends inside a training dike on the east side of Everett; depths of 15 to 8 feet are in the channels to the gap at **Preston Point.**

Anchorages.—The general anchorage area westward of the waterfront is defined in **202.230,** Chapter 2. Vessels usually proceed to the wharves.

Tides.—The mean range of the tide at Everett is about 7.4 feet, while the range between mean lower low water and mean higher high water is 11.1 feet.

See Appendix for **storm warning display.**

Pilotage.—Pilots may be obtained from the Puget Sound Pilots office, Seattle, by telephone or radio.

Towage.—Tugboats ranging in size from 90 to 1,200 horsepower are available from either of two tugboat companies.

Quarantine.—Vessels subject to quarantine inspection usually proceed to their docks for inspection. Fumigation may be arranged for through the Seattle office. The U.S. Public Health Service maintains an outpatient office at Everett.

Customs.—Everett is a port of entry.

Harbor regulations are enforced by the manager of the Port of Everett, who serves as harbormaster and port warden.

Wharves.—The deep-water wharves in the harbor have depths up to 38 feet. One is used for public transportation purposes, one is owned by the Great Northern Railway and is leased for storage purposes, and two are used by pulpmills. There are the usual facilities for handling dry cargo. Equipment for a maximum lift of 25 tons is available. Oil is delivered by barge to wharves with about 12 feet of water at their ends. The Port of Everett maintains floats and moorings for berthing small boats up to 50 feet in length.

The piers at the head of Port Gardner are used by a tugboat company.

Supplies.—Water, groceries, and marine hardware can be obtained. Gasoline and diesel oil are available.

Repairs.—A marine railway can haul out craft to 250 tons for general repairs; the firm's crane capacity is 7 tons. There are machine shops here which can perform most work required.

Communication.—Everett is served by three transcontinental rail lines and several truck and bus firms. The city is a port of call for coastwise freighters and many foreign ships that call to load lumber. The county airport, Paine Field, is 6 miles south-southwestward of the city.

Snohomish River, once heavily traveled by the light-draft river steamers and loggers, empties mostly through the gap abeam of Preston Point; however, much of the flow continues down through the outer channel and settling basin opposite Everett. Several sawmills are along the river; logging regulations are given in **207.770,** Chapter 2. Drawspan regulations for the bridges crossing the shallow lower part of the river are given in **203.805,** Chapter 2.

The flats north of Everett at the mouths of **Steamboat Slough** and **Ebey Slough** are used for log storage. Drawspan regulations for the bridges crossing the shallow sloughs are given in **203.805,** Chapter 2. Navigation across the shallow flats should not be attempted without local knowledge.

Sandy Point, the southern point at the entrance to Saratoga Passage, is a low spit rising abruptly to 100 feet, with bluffs on each side; it is marked by a light.

Camano Head, 1.5 miles north-northeastward of Sandy Point, is the southeastern point of Camano Island. A shoal, with a rock bare at low tide, extends nearly 0.2 mile southeastward from the point, and is marked by a buoy.

Tulalip Bay, 4 miles northwest of Everett, is a small cove on the mainland. On the northern side are the village of **Tulalip** and the agency buildings of the Tulalip Indian Reservation. The bay is shoal, with rocks extending more than 300 yards southward and westward from the point on the north side of the entrance. A buoy marks the edge of the shoal water westward of the point at the south side of the entrance. Several small wharves and landing floats, mostly dry at low water, are at Tulalip. There are log-booming grounds in the southern part of the bay. **Mission Beach,** immediately southward of the bay, has boathouses and float landings.

Chart 6450.—Camano Island extends between Port Susan and Saratoga Passage. It is irregular in shape and 14 miles in length, the southern portion consisting of a long, narrow tongue that terminates in Camano Head, 300 feet high. At its northern end it is separated from the mainland by **Davis Slough,** and South Pass and West Pass of the Stillaguamish River, all dry at low water.

Port Susan, on the eastern side of Camano Island, extends about 11 miles in a northwesterly direction, terminating in flats which bare and extend over 3 miles wide at its head. There are several resort settlements. Deep water is throughout until nearing the head, where anchorage may be had off the extreme western edge of the flats in about 10 fathoms. Care should be used in approaching and anchoring, as the flats rise abruptly from deep water.

Stanwood is in a dairying and farming district on the north side of the Stillaguamish River at the junction of the **South** and **West Passes.**

Saratoga Passage, on the westerly side of Camano Island, extends some 18 miles in a northwesterly direction from its entrance between Sandy Point and Camano Head. At its northerly end it connects with Penn Cove and Crescent Harbor, and leads eastward into Skagit Bay. Depths in the passage are from 100 fathoms at the entrance to 17 fathoms at the Crescent Harbor entrance. There are few outlying dangers, and a midchannel course is clear.

There is considerable traffic in these waters, mostly pleasure and fishing craft, with occasional tugs bound to or from Deception Pass. This is a popular resort area; along the shores of the islands are frequent small marinas which provide gasoline and usually berths, launching service, fishing supplies, and occasionally meals and lodgings. Principal commercial products are lumber and fish.

Langley, on Whidbey Island about 1.2 miles westward of Sandy Point, is a banking town serving a farm community. Two of the waterfront facilities provide gasoline, water, lubricants, fishing supplies, and some repairs. Depths of about 7 feet are off the landing floats. Tugboats often anchor off the beach between Langley and Sandy Point.

East Point, 6 miles northwestward of Sandy Point, is a low sandspit about 300 yards long. It is marked by a light.

Elger Bay, a resort on the western shore of Camano Island across Saratoga Passage from East Point, is an open bight 1 mile wide. Tugboats anchor here in westerly and northwesterly winds.

Holmes Harbor, entered 8 miles northwestward of Sandy Point, indents Whidbey Island 5 miles in a southerly direction. Depths range from 30 or 40 fathoms off the entrance to 17 fathoms near the head, where good anchorage, except from northerly weather, may be had in mud bottom. For limits and regulations of the anchorage area, see **202.230,** Chapter 2. **Rocky Point,** at the east side of the entrance, is low but rises abruptly to 500 feet. **Hackney Island,** 0.2 mile off the point, has several houses on it. Shoals, marked by a buoy, extend out from the point.

Greenbank, a small farming settlement, is on the western side of Holmes Harbor at the entrance. It has a store and service station. Anchorage against westerly weather is available off Greenbank in 12 to 18 fathoms, muddy bottom. **Freeland** is a community at the head of the harbor, but the business center for this area is **Harbor Center,** a village with stores and shops about 0.5 mile southward of the head of the harbor. There is a log dump at the head of the bay.

Camano, a settlement on the eastern side of Saratoga Passage, is 3.5 miles northwestward of **Lowell Point.** It has a store, a service station, and a hotel. Gasoline is available only to craft that can get in close to shore as there is no wharf. A light is on **Onamac Point,** 0.8 mile northward of Camano. **Madrona** is a small resort about 2 miles northward of Camano. There is a small pleasure pier built out to about 6 feet at **Madrona Beach.**

Penn Cove indents the western shore of the basin at the head of Saratoga Passage and extends westward for about 3.5 miles. In most weather, the cove affords good protection in 5 to 15 fathoms, good holding ground.

Off **Snatelum Point,** the southern point at the entrance to Penn Cove, is a narrow spit extending northward 0.5

mile, with ¼ fathom near its end. The spit is marked by a buoy.

Blowers Bluff, the northern point at the entrance to Penn Cove, is bare, light-colored, high, and rounding. Rocks lie offshore 200 yards at places along the bluff. The shoal extending off the southwestern end of the bluff reaches almost one-third the distance across Penn Cove. Vessels should favor the southern shore when passing this shoal.

Coupeville, the county seat of Island County, is on the southern shore of Penn Cove about 2 miles from the head. It has hotels, stores, a garage, and a wharf built out to 12 feet. Gasoline and fresh water are piped to the wharf and diesel oil, brought in by barges, may be obtained ashore. A rock covered 17 feet is about 300 yards northeastward of the wharf. Vessels generally approach the wharf from the northwestward. Shallow-draft vessels with local knowledge can pass inside the rock to approach from the eastward.

San de Fuca, a small town on the northern shore about 0.5 mile from the head, has a store, service station, and a wharf built out to 10 feet. Gasoline and diesel oil can be had by truck delivery.

Chart 6404.—Oak Harbor, which indents the northern shore of Saratoga Passage westward of Crescent Harbor, is a semicircular cove about 1 mile in diameter with depths of 20 to 9 feet. **Maylor Point,** the eastern point of the entrance, is foul with several rocks, awash at low water, 0.5 mile eastward from the point. These rocks are marked by a buoy. The town of **Oak Harbor** on the northern shore of the harbor serves a farming community. The long wharf, in poor condition, has been condemned; it was not being used in 1962.

Crescent Harbor, immediately east of Oak Harbor, is a semicircular bight 2 miles in diameter, between **Forbes Point** and **Polnell Point,** each of which is marked by a light. Polnell Point is wooded and rather bold, and connected to the main island by low ground, giving the point the appearance of an island from a distance off. There is a shoal extending westward 0.9 mile. Foul ground surrounds these points, but otherwise the harbor is clear, affording anchorage in 10 to 11 fathoms, muddy bottom. It is exposed to the southward. A large pier extends from the west side of the harbor with a depth of 26 feet for the outer two-thirds.

Crescent Harbor and the eastern part of Oak Harbor are included in a **restricted area**; limits and regulations are given in **207.750,** Chapter 2.

Chart 6450.—The southern entrance to **Skagit Bay** lies between Polnell Point and Rocky Point. The bay is about 12 miles long in a west-northwesterly direction. The greater portion of it is filled with flats, bare at low water, and intersected by numerous channels discharging the waters of Skagit River.

A natural channel varying in width from 0.2 to 0.6 mile and marked by buoys follows the western shoreline of Whidbey Island to the north of the bay. Shoal water extends off for some 100 to 300 yards from the western shore of the island. The northern part of Skagit Bay is described in Chapter 12.

The controlling elevation of the flats at the mouth of South Fork is about 2.5 feet above mean lower low water and the controlling depth at low tide depends on the river stage, probably not exceeding 1 foot during periods of minimum flow. The diurnal range at the mouth of the river is 11.3 feet. The extreme range at this point is estimated to be 20 feet.

A highway bridge across the South Fork at **Conway,** 4.8 miles above the mouth, has a swing span with a clearance of 10 feet; see **203.810,** Chapter 2, for drawspan regulations.

Utsalady, a small village on the northern shore of Camano Island about 1.2 miles northeastward of Rocky Point, has a store and service station. Vessels may anchor just eastward of Utsalady in a small inlet between the shoal water of the flats and the shore in 3 to 6 fathoms, muddy bottom, with shelter from southerly winds. In the 1860's Utsalady became the first ship-building port in Puget Sound.

Strawberry Point, the eastern extremity of Whidbey Island, is marked by a light.

The **South Fork** channel leading into Skagit River winds through the flats northward of Camano Island where it is marked by a light and buoys. Due to the shoaling, however, it has largely been abandoned by boat traffic to Mount Vernon and **North Fork** is used instead.

Chart 6401.—The entrance to **Hood Canal** is at the lower end of Admiralty Inlet, between Foulweather Bluff and Tala Point, about 10 miles southward of Marrowstone Point. It extends in a general southerly direction for about 44 miles and then bends sharply northeastward for 11 miles, terminating in flats bare at low water. The head of Case Inlet, in the southern part of Puget Sound, is less than 2 miles from the head of Hood Canal.

The shores are high, bold, and wooded, but they have been logged off to a considerable extent and the exposed area rises to a much greater height, particularly on the western shore, than in other parts of the sound. The water is deep except at the heads of the bays and at the mouths of the streams. Many small craft ply these waters. There are mostly small float-landings and private docks in the canal. Gasoline, lubricants, and fishing supplies are available at a few places.

The Olympic Loop Highway follows the western shore of Hood Canal, and a connecting highway to Port Orchard follows the southern shore of the southern part of the canal around The Great Bend. There are road connections with Port Orchard and with the Puget Sound highway system from all the settlements on the eastern shore of the canal.

Water traffic in general is confined to tugboats with log rafts, small boats, and many pleasure craft. Along the shores are numerous small farming or lumber settlements, some with wharves or landing floats. Hood Canal is a favorite vacation resort. Numerous tourists camps are located along the shores, particularly on the western side.

The **tidal currents** in Hood Canal at times attain veloci-

ties exceeding 1.5 knots. At times there are heavy tide rips northward of and around Foulweather Bluff, sufficiently heavy to be dangerous to small boats and to break up log rafts. This is most pronounced when the ebb current from the main body of Puget Sound meets that from Hood Canal off the point, and particularly so with the ebb against a strong northerly or northwesterly wind. Off Point Hannon and Hazel Point, tide rips occur at times sufficiently strong to be troublesome to tugboats with log tows. Current observations taken at a station in midchannel eastward of Hazel Point show that directions of both flood and ebb vary considerably at that location. At times southwesterly winds from Hood Canal and northerly winds from Dabob Bay cause a chop dangerous for small boats. Under these conditions smoother water is found near either shore.

The dangers are few and generally close inshore. A few low sandspits from 100 to 300 yards long are difficult to see at night, but most of them have been made into resorts and the buildings nearby show up well against the background of trees. Flats off the mouths of streams extend as much as 0.5 mile offshore and are extensive at the heads of some of the bays. A midchannel course is clear until reaching The Great Bend, where the canal turns eastward. Here the northern shore just eastward of Ayres Point should be favored to clear the flats extending from the eastern part of Annas Bay.

Chart 6421.—Twin Spits are two long, low, sand points, 0.5 mile and 1 mile southward of Foulweather Bluff. When waiting for smooth weather to round Foulweather Bluff, tugboats with log tows often anchor in 50 feet a mile southeastward of the southern spit, in a bight known locally as **Races Cove,** with Colvos Rock Light slightly clear of the end of the southern point of Twin Spits.

Hood Head, on the western side of Hood Canal 3 miles southward of the entrance, is almost an island, having only a narrow strip of low sand connecting it with the western shore. The head is 210 feet high, steep and wooded, and is a prominent feature in the entrance.

Point Hannon is at the eastern extension of Hood Head; it is marked by a light. A low sandy spit with shoal water extends about 200 yards eastward of the light.

Local magnetic disturbance.—Differences of more than 2° from normal variation have been observed in Hood Canal at Point Hannon.

A 6-foot shoal, marked by some kelp, extends more than 300 yards southward of Hood Head.

Shine is a village on **Termination Point,** 1.7 miles southwestward of Point Hannon. There is a lighted transformer substation on the point.

The pontoon highway bridge over the canal between Termination Point and Salisbury Point westward of Port Gamble has two fixed openings; the clearance of the westerly opening is 30 feet and that of the easterly opening, 50 feet. In the 600-foot center opening there are pontoons which are retracted for larger vessels; see **203.784,** Chapter 2, for drawspan regulations. A fog signal is at each opening.

Sisters, two rocks 200 yards apart, 0.5 mile southward of Termination Point, are awash at about half tide. A light is on the southern rock, 0.4 mile from the northern entrance point to **Squamish Harbor,** an open bight just southwestward of Termination Point. Tugboats frequently anchor near the head of the harbor in about 6 fathoms, muddy bottom.

Case Shoal, partly bare at low water, is about 0.6 mile from and parallel with the western shore of Squamish Harbor.

Port Gamble is a small inlet on the eastern shore of the canal 5 miles from the entrance. It is 2 miles in length with a contracted entrance.

In 1962 the controlling depth from deep water in Hood Canal to the lumber facilities was 28 feet.

Port Gamble, the town on the western shore at the entrance, is owned by the lumber company which controls all facilities, including the local hotel and hospital, stores and service. The main lumber wharf has ample depths for most deep-draft vessels. Just north of the hotel there is a small-craft mooring basin with floats and a launching railway; gasoline and lubricants are available. A shoal covered 8 feet is about 85 yards northeastward from the north end of the northerly lumber-mill pier. There are rocks baring at low tide off the wharf. Supplies of all kinds may be obtained from Seattle on short notice.

Excellent anchorage may be had in the bay in 24 to 54 feet, muddy bottom.

Vessels should hold a midchannel course on entering Port Gamble until 200 yards or more past the southern light, and then head for the wharf, keeping the long eastern face open to avoid shoal water on the western side of the channel.

In entering the bay care should be taken not to work too far to the eastward when passing the mill wharf. A sandspit, partly bare at low water, extends from the point in front of **Indian Village** almost to the edge of the dredged channel, or about halfway to the mill wharf.

Caution.—Several vessels have grounded on the sandspit 1.5 miles northward of the town. The entrance lights are easily confused with lights in the Indian Village.

Chart 6422.—Thorndike Bay is a small bight on the west side of Hood Canal about 4 miles southward of Squamish Harbor. An **explosives anchorage** is southward of the bay; limits and regulations are given in **202.230,** Chapter 2.

Bangor Wharf on the east side of the canal, 12.7 miles southward of the entrance, is the property of the U.S. Navy and is restricted to use by vessels under Government jurisdiction; limits and regulations governing the restricted area surrounding it are given in **207.750,** Chapter 2. A **Naval operating area** extends north and south of the wharf; limits and regulations are given in **204.222,** Chapter 2.

Bangor, a village on the eastern side of the canal 14.5

miles southward of the entrance, has a store and service station. The wharf is in ruins. It is connected to the highway system of Puget Sound. **King Spit,** a low, sandy point at the southern side of the town, affords some protection from southerly weather.

Chart 6450.—Seabeck, 21 miles from the entrance of Hood Canal, is a settlement and summer resort at the head of **Seabeck Bay,** a small cove on the eastern shore. It has a store. There is a wharf with a depth of 14 feet alongside, with a launching elevator for small craft. Petroleum products and fishing supplies are available. Shoal water extends 0.5 mile from the head of the bay. Good anchorage, well protected from southerly and southeasterly weather, is afforded in the bay in 5 to 10 fathoms. Shoal water extends more than 200 years off **Misery Point,** at the western side of the entrance of the bay.

Oak Head, 2 miles northward of Misery Point, is the southernmost point of **Toandos Peninsula. Hazel Point** 1.8 miles east-northeastward of Oak Head, is the turning point where the canal bends sharply from southward to southwestward.

Fisherman Harbor is a cove on the southern end of Toandos Peninsula, just eastward of Oak Head. It is very narrow, with a constricted entrance which is practically bare at low water. A sandspit extends partly across the entrance from the western shore.

Brinnon is a village on the southern side of **Dosewallips River,** 3.5 miles westward of Oak Head, at the entrance of Dabob Bay. It has tourist facilities and a wharf used for unloading logs.

Dabob Bay, the largest inlet in the canal and separated from it by Toandos Peninsula, extends 9 miles in a northerly direction. The entrance is between **Tskutsko Point** and **Sylopash Point** just northward of the mouth of Dosewallips River. The western shore of Dabob Bay is particularly steep and bold, reaching an elevation of over 2,600 feet in less than 2 miles from the coast. There is a **Naval operating area** in the bay; limits and regulations are given in **204.222,** Chapter 2. Flashing white lights are off Pulali Point and Sylopash Point; a flashing green light will be shown when naval operations in the area require caution, and a flashing red light will be shown when the area is closed to navigation due to naval operations.

Quilcene is a village at the mouth of **Big Quilcene River,** on the western side of Dabob Bay and near the head of **Quilcene Bay.** There are stores, garages, a hotel, tourist camps, and service stations here. The small-craft haven has a launching ramp, and gasoline and water are available.

Pleasant Harbor is a small cove on the western shore of Hood Canal about 3 miles westward of Misery Point. It is about 300 yards wide, and has a narrow shallow entrance. Owing to the narrowness of the entrance, boats should keep in midchannel until clear of the ¾-fathom shoal. Inside there is a sheltered anchorage for small boats in 6 fathoms. A large log dump and log boom are in the harbor.

Triton Head, on the western shore, is 8.2 miles southwestward of Oak Head. It is low, rocky, and timbered, with a reef that bares extending 200 yards northward from the point. **Triton Cove** is a small cove formed by the head and the western shore, which affords anchorage for small craft against southerly winds. Oyster beds, marked by stakes and brush, are about 0.8 mile northward from Triton Head on the flat which extends off the mouth of **Fulton Creek.**

Chart 6460.—Holly, on the eastern shore of Hood Canal, is a settlement on the southern side of a small bight about 10 miles southwestward of Oak Head. It is a summer resort with a store and service station. The wharf is in ruins. Shoal water extends about 300 yards from shore northward and eastward of the wharf ruins. **Anderson Cove** is the shallow cove directly northward of Holly. It is used for rafting logs.

Eldon is a western shore settlement on the southern bank of **Hamma Hamma River,** about 12.5 miles southwestward of Oak Head. It has a store and tourist camps. The delta flats of Hamma Hamma River extend nearly 0.5 mile from shore. An abandoned logging wharf, in ruins, is at the southern end of the flats. There are log booming grounds in the cove to the southward.

Lilliwaup is a village on the southern shore of **Lilliwaup Bay,** a small shallow cove on the western shore of Hood Canal about 18 miles southwestward of Oak Head. It has a tourist camp. About a mile southward, a small-boat facility is at **Restwhile,** where gasoline and water may be obtained.

Dewatto is a small settlement on the southern side of **Dewatto Bay,** a small, shallow cove on the eastern shore opposite Lilliwaup.

Hoodsport, the largest town on Hood Canal, is on the western shore 21 miles southwestward of Oak Head. It has hotels, stores, garages, tourist facilities, and a State fish hatchery.

Hoodsport Marina, with a pier and elevator lift, has depths of 23 feet off the end of the lift. Gasoline and diesel oil are pumped at the dock; ice, water, fishing supplies, and groceries are available.

Potlatch is a summer resort on the western side of the canal about 2 miles southward of Hoodsport and opposite **The Great Bend** where Hood Canal turns northeastward. It is on the Olympic Loop Highway. A large powerplant with a standpipe can be seen on the western shore 0.5 mile southward of the resort.

Union is a town on the southern shore of The Great Bend. There is a float landing and a small wharf equipped with derrick for launching and hoisting small craft. Boats should approach the landing from the northeastward and beware of snags. A marina here supplies gas and oil, water, and fishing supplies, and can make limited repairs to small boats. The depth alongside the float is reported sufficient for small boats at all stages of the tide. The town has a hotel, stores, and a tourist camp.

Annas Bay, immediately westward of Union, is a broad, open bight, the eastern half being flat and bare at low water. This flat extends about 0.2 mile into the canal immediately westward of Union and is formed by the **Skokomish River** which empties at the head of the bay.

At the western end of the bay are the ruins of a sawmill and wharf. There are no settlements of importance eastward of Union.

Hood Canal terminates in **Lynch Cove,** with flats, mostly bare at low tide, about 2.2 miles from the head. About 3 miles from the head is a launching ramp where gasoline may be obtained.

Charts 6445, 6446.—Port Orchard is an extensive body of water, westward of Bainbridge Island, 15 miles in length. Its northern end connects with Port Madison through Agate Passage. At its southern end Port Orchard connects with Puget Sound through Rich Passage. The depths in the main body of Port Orchard range from 36 to 150 feet with few dangers and these, as a rule, are close inshore. The shores are moderately low and wooded. Villages and numerous cottages line the shores.

Current observations taken in midchannel about 1 mile southward of **Tolo** indicate that the tidal current in that locality is very weak.

Chart 6445.—Agate Passage is the northern entrance to Port Orchard and connects it with Port Madison. The channel extends a mile in a southwesterly direction. The controlling depth is about 20 feet. The passage is straight; the shores are wooded and fairly steep-to; the shoreline is mostly rocky and fringed with kelp to Point Bolin. The currents have velocities up to 6 knots; the flood sets southwestward and the ebb northeastward.

The passage is obstructed by a shoal near the middle of the northern end with depths of 9 to 10 feet, and there are other depths of 14 to 18 feet almost in midchannel.

The northern entrance is marked by a light on the western side of the channel opposite **Agate Point;** buoys mark the channel through the passage.

A fixed highway bridge, just southward of Agate Point, has a clearance of 75 feet.

Liberty Bay is a narrow inlet extending about 4 miles in a northerly direction from the northwestern part of Port Orchard. The southeastern half of the bay is narrow and tortuous. The shores are low and wooded; the shoreline is mostly sand and gravel. There are mud flats at the head of the bay and in the small bight on the southern side of the bay. Mud is the predominating bottom characteristic. The current velocity is 0.8 knot north of Keyport, in the narrow entrance to the bay. Velocities exceeding 1 knot occur at times.

The **Keyport Navy Torpedo Station** with two wharves is on the western side of the entrance to Liberty Bay. One wharf is built out to 19 feet, and the other to 26 feet. There are several prominent buildings on the reservation.

Torpedo warning.—A red flag hoisted on the south wharf at the torpedo station and one displayed on float west of Battle Point indicate that torpedo firing is in progress and vessels are to keep well to the east of the channel clear of the range marked by white buoys. Limits and regulations for the restricted area are given in **207.750,** Chapter 2.

Keyport is on the southern side of the passage leading to Liberty Bay. A power cable with clearance of 90 feet crosses the passage at Keyport. There is a wharf with a float for small craft.

A covered rock is 175 yards southeastward of the dock on the eastern side of the bay about midway between Lemolo and Poulsbo.

Poulsbo, a fishing and pleasure resort on the east shore at the head of the bay, has many small-craft wharves and floats with depths of 8 to 12 feet at their ends. Gasoline, lubricants, water, and fishing supplies are available. A boatyard here can make repairs to small craft. Oysters are cultivated on the flats at the head of the bay.

Manzanita is a settlement on the western side of Bainbridge Island in a small cove about 1.5 miles southward from Seabold. **Manzanita Bay,** southward of the town, affords an excellent anchorage for small craft in 27 feet, mud bottom. There are several private wharves and floats in the bay. Caution is urged to avoid rows of submerged piling on each side of the bay, about midway in from the entrance.

Battle Point, a sandy spit on the eastern side of Port Orchard about 1.7 miles southward of Point Bolin, marks the turn in the direction of the channel from southwest to southward. A light is off the end of the spit.

Brownsville, on the western shore of Port Orchard, is on the northern shore of **Burke Bay,** about 1.2 miles southwestward of Battle Point. The town has a landing wharf built out to 10 feet. All of Burke Bay bares, but it may be entered by small boats at about half tide.

Chart 6446.—The easterly and principal approach to Port Orchard from Puget Sound is southward of Bainbridge Island through Rich Passage, between Restoration Point and Blake Island. It is deep and free from dangers, except for **Bainbridge Reef,** covered 36 to 54 feet, and currents in the constricted western part of Rich Passage.

Orchard Point, the southern point at the entrance to Rich Passage, is marked by a light and fog signal. A general **anchorage area** is in the vicinty of the point; limits and regulations are given in **202.230,** Chapter 2.

Rich Passage is about 3 miles long, with a sharp bend near its western end, where it narrows to 0.2 mile. **Orchard Rocks,** some 400 yards in extent, are on the northern side of the channel just inside the eastern entrance. A small area near the center of the reef, which uncovers, is marked by a white echo board facing northeast and southwest. The rocks are marked off their south end by a lighted buoy. The reef off **Point Glover** is marked by a light and fog signal. **Waterman Point,** at the western entrance, is marked by a light and fog signal. A lighted buoy marks the southern edge of the shoal extending from **Point White,** the north point at the western entrance.

Currents.—Continuous observations in midchannel between Point Glover and Point White and at other points in the passage indicate that:

The current velocity is about 3 knots, and the strongest observed currents were 4 knots on the flood and 5 knots on the ebb. Ferry pilots on the regular daily run between

691-231 O—63——15

Seattle and Bremerton advised that on rare occasions they have experienced ebb currents of "at least" 6 knots in the vicinity of Buoy 10.

Near the time of slack, the average period when the velocity does not exceed 0.2 knot is about 20 minutes. For strong currents these periods will be decreased, and for weak currents they will be increased.

In the channel between Pleasant Beach and Point Glover, the velocity on the flood is 1.2 knots and on the ebb, 2.2 knots. North-northwestward of Orchard Rocks, the velocity on the flood is 0.5 knot and on the ebb, 2 knots.

On the flood, the lines of stream flow are nearly uniform except off the bight just northwestward of Middle Point and in the large cove on the north shore opposite Point Glover. Eddies do form in those two places, but they do not extend outward to the usual vessel track. On the ebb, however, extensive eddies and countercurrents do occur, owing to the funnel-shaped configuration of the passage.

Between Middle Point and Point Glover, an extensive eddy extends from shore almost to midchannel, and will frequently be encountered by vessels on the track between Orchard Rocks and Point Glover buoys.

An eddy fills the cove on the northern shore opposite Point Glover, but does not extend outward to the vessel track.

An eddy occurs about 0.2 mile south-southwestward of Point White and a little northward of midchannel at the western entrance to the passage. A weak countercurrent occurs inshore along the southeastern side of Point White.

These eddies and countercurrents on the ebb greatly diminish the effective width of the passage, and so increase the velocities in the channel.

Strangers should not attempt to navigate Port Orchard, and particularly Rich Passage, in thick weather on account of the strong tidal currents. In clear weather, however, the navigation of these waters presents no unusual difficulty.

Caution.—Rich Passage, because of activities of the Puget Sound Naval Shipyard, has a large volume of traffic. Many ferries a day each way, tugs with hawser tows, and various types of naval craft, all contribute to create a considerable collision hazard in the passage, particularly at the sharp bend off Point Glover. Strong tidal conditions prevail in this vicinity, and deep-draft outbound vessels making the sharp turn may be unavoidably set well over toward the eastern shore, necessitating a two-blast, starboard-to-starboard meeting with inbound vessels.

Fort Ward is a naval post on Bainbridge Island near the eastern entrance to Rich Passage, just inside Beans Point. There is a wharf built out to 18 feet. A rocky patch covered 11 feet, 150 yards southward of the wharf, is dangerous to vessels approaching from southward.

Illahee is a small settlement on the western shore 2.7 miles north of Point Herron. Illahee has a wharf, stores, and a service station. About 1 mile south of **Illahee State Park,** is a public wharf with floats for pleasure craft only.

Fletcher Bay is a village on the eastern shore of Port Orchard about 1.2 miles southward of Battle Point. Small boats can enter the bay at three-quarter tide and find anchorage in 12 feet, mud bottom; the swinging area is limited. The bar across the entrance bares at half tide.

Chart 6440.—Sinclair Inlet, site of the city of Bremerton and the Puget Sound Naval Shipyard, is entered from Rich Passage and Port Orchard on the east, and Port Washington Narrows on the north. The inlet is 3.5 miles in length, extending in a west-southwesterly direction from **Point Herron,** which is at the junction of Port Washington Narrows and Port Orchard. The point is marked by a light and fog signal.

East Bremerton is the community back of Point Herron, on the eastern side of the Port Washington Narrows entrance. The fixed highway bridge crossing the narrows here has a clearance of 82 feet.

Sinclair Inlet is a **Naval restricted area;** limits and regulations are given in **207.750,** Chapter 2.

Annapolis is a village on the southern shore of Sinclair Inlet directly south of Point Herron. A long ferry wharf here serves the ferry operating to Bremerton. Eastward of the ferry landing is a public wharf and float suitable for small craft only. The float grounds at low water. The buildings of a veterans home on the bluff above the town are prominent.

The town of **Port Orchard** is on the southern shore just west of Annapolis. It has a ferry wharf and float landing with a depth of 10 feet, an oil wharf with 10 feet alongside at which small boats can obtain gasoline, and several small private landings. Passenger ferry service is maintained with Bremerton.

A boat works on the west side of Port Orchard can haul out craft up to about 15 tons for general repairs; gasoline, water, and some hardware are available.

A flat that bares extends 0.4 mile from the shore of the bight eastward of Port Orchard. A buoy marks the edge of this shoal.

Puget Sound Naval Shipyard occupies most of the northern shore of the inlet. The hammerhead crane near the inshore end of pier 6 of the yard is one of the most conspicuous objects from any direction.

The Navy graving dock is one of the largest in the world. Its inside dimensions are 1,150 feet long, 180 feet wide at the yard level, 188 feet wide on the floor, and 54 feet over the sill. This facility was built to accommodate the largest supercarrier. When not committed to Navy use, and under certain conditions, the graving dock may be used by other ships that are too large for commercial docks.

Bremerton adjoins the shipyard, and most of the city's business and affairs are keyed to the needs of the Navy establishment. The city limits include East Bremerton on Point Herron. Frequent ferry service connects with Seattle and other points in Puget Sound.

Chart 6446.—Port Washington Narrows, 3 miles in length, joins Sinclair and Dyes Inlets. Tidal currents in the narrows attain velocities up to 4 knots at times. See

the Tidal Current Tables and Tidal Current Charts for details. About 14 feet can be taken through the narrows.

An oil wharf, built out to 15 feet, is on the western shore of Port Washington Narrows about 0.2 mile above the bridge. About 100 yards south of the bridge, a boatyard has a marine railway capable of hauling out craft up to 10 tons; general repairs are made, and gasoline, lubricants, and some hardware are available. Groceries can be obtained in East Bremerton. A power cable crosses the narrows 700 yards above the bridge with a clearance of 90 feet. About 0.8 mile above the southerly bridge, a fixed highway bridge with clearance of 80 feet crosses the narrows. A power cable close westward of this bridge has a clearance of 80 feet.

Anderson Cove is a small bight on the south shore about 1.5 miles above the southerly bridge. As there is little or no water, small boats anchor off the cove. There is a small-boat mooring and service station here. **Sheridan,** on the eastern shore of the narrows about 2 miles above the entrance, has a landing wharf.

Phinney Bay, 0.8 mile long, makes into the western shore opposite Sheridan. A yacht club maintains a moorage with floats on the west side of the bay. **Rocky Point** is on the western side of the northern entrance of the narrows. There are tide rips off this point.

Dyes Inlet extends about 3 miles north-northwesterly to the village of **Silverdale,** on the western side. There are several villages on the shores of the inlet which is used by fishermen and pleasure boatmen. At Silverdale there is a long wharf serving the sawmills and other facilities. Depths of 10 feet are off the wharf; gasoline, lubricants, and groceries are available. On the eastern shore, just north of the narrows, is the village of **Tracyton,** which has a concrete launching ramp; on the south side of the village is a boatyard where small craft are built. **Chico** is a small residential town on the western side, next to **Chico Bay**; the log dump wharf is in ruins.

Ostrich Bay is an inlet in the southwestern part of Dyes Inlet. A covered rock is reported in Ostrich Bay 500 yards southward of **Elwood Point** inside the breakwater extending southerly of the point.

A depth of 6 feet can be carried from Ostrich Bay into **Oyster Bay** on midchannel courses. There is 6 feet or more in Oyster Bay.

Chart 6460, 6446.—East Passage, on the eastern side of Vashon and Maury Islands, extends from Alki Point southeastward for 12.5 miles to Robinson Point, and thence southwestward for 6 miles to Browns Point. The waters throughout are deep and free from dangers, which in no case extend as much as 0.5 mile from shore.

Fauntleroy Cove, 3.5 miles southward of Alki Point, is the site of the landing for the automobile ferry plying from there to Vashon Heights and Southworth. On the west side of the passage, the bight included between Orchard Point and Point Southworth, and protected on the east by Blake Island, is an anchorage area; limits and regulations are given in **202.230,** Chapter 2.

There are several settlements and resort villages on its shores; mostly sport fishermen and vacationists use these waterfront facilities. **Manchester** has a long wharf, formerly used by the ferry, in poor condition and no longer maintained. There is a small-craft float off its end. A large wharf and oil storage facility, owned by the Federal Government, is on the south side of Orchard Point. **Harper,** a mile west of Point Southworth, is the site of another former ferry wharf. The ferry from Seattle and Vashon Island docks at the slip on Point Southworth.

Blake Island, about 1 mile in extent, 249 feet high, and covered with trees, is off the northern entrance to Colvos Passage. Heavy tide rips, strongest with a flood current, and strong southerly winds are encountered at the northern entrance to Colvos Passage southward of Blake Island. Shallow, irregular bottom extends about 0.5 mile off the northern shore of the island. A light is on the northeastern point of the island. Just southward of the northeastern point of the island are the ruins of a wharf. An **explosives anchorage area** is eastward of the island; limits and regulations are given in **202.230,** Chapter 2.

Yukon Harbor, about 2 miles southwestward of Blake Island, affords anchorage in 30 to 50 feet, with protection from southerly winds.

Vashon Island is 11 miles long in a northerly direction. **Maury Island,** actually a peninsula of Vashon Island at its southeast extremity, is connected to it by a narrow neck of land surmounted by a highway. Maury Island is about 5 miles long.

On these islands the land is of moderate rolling, elevation, and in places rugged, and the country throughout is heavily wooded except for the numerous farm clearings. The transmitting towers of Seattle broadcasting stations are on the islands; two groups of towers are on Vashon Island and two on Maury Island. The shores on all sides have numerous settlements. The county wharves, formerly used to ship farm produce, are no longer kept in repair, and shipments are now by truck.

Point Vashon, the northwestern tip of Vashon Island, is 305 feet high, steep, and wooded. Shoal water extends 0.2 mile northward from the point and nearly as far along the northern shore as **Dolphin Point,** 1 mile eastward. A light and fog signal are 300 yards northward of Point Vashon.

Vashon Heights Landing, 0.5 mile eastward of Point Vashon, has a combination ferry slip and landing wharf built out to 14 feet. An automobile ferry runs to Fauntleroy.

The tall radio towers of station KOMO are on Point Beals. The town of **Vashon** is on high land 1.5 miles southwestward of Point Beals.

A **measured nautical mile,** on course **159°58′,** is eastward of Point Beals. The range markers are steel towers with round yellow targets.

Point Pully, about 7.8 miles southward of Alki Point, is a sharp low spit, projecting 300 yards from the high land which in 1 mile rises to an elevation of 430 feet. On the low part of the point is **Three-tree Point,** a grassy knoll 30 feet high, with several trees on it. A light and fog signal are on the point.

Point Heyer on Vashon Island, a sandspit behind which

the ground rises rapidly, is about 2.5 miles southward of Point Beals. A shoal extends 0.2 mile southeastward from the point. A radio tower on this point is about 450 feet high.

Portage is a village extending over both sides of the low isthmus that connects Vashon and Maury Islands. At extreme high tides the isthmus almost covers. Just northward of the isthmus is an oil wharf. Several tanks are here. Two radio towers, about 526 feet high, are 0.6 mile southward of the isthmus.

Robinson Point, the easternmost end of Maury Island and the major turning point in the passage, is a low spit projecting 140 yards from the wooded high land. **Robinson Point Light (47°23.3′ N., 122°22.4′ W.),** 40 feet above the water, is shown from a white octagonal tower on the point; a fog signal is at the station.

Redondo, on **Poverty Bay,** about 6.8 miles southeastward of Point Pully, is a suburban village with small-craft facilities; there is a float landing and a launching elevator here. A privately maintained light is on a marina. **Dumas Cove,** 2 miles westward of Redondo, has several small wharves which bare at low water.

See Appendix for **storm warning display.**

Quartermaster Harbor extends 5 miles northeastward between the southerly parts of Vashon and Maury Islands, opposite Commencement Bay. Its shores are low and wooded, with numerous clearings, and several landings and private piers.

Quartermaster Harbor affords excellent anchorage about 2 miles inside the entrance in 5 to 10 fathoms, muddy bottom. The harbor is easy of access, and a midchannel course may be followed with safety.

A shoal just inside the entrance, between **Neill Point** and **Piner Point,** extends 300 yards from the eastern shore and is marked by a buoy. In an area just northward of Neill Point, shoal spots extend 400 yards offshore, covered 2¼ to 2¾ fathoms. Depths of 4¼ fathoms are near midchannel westward of **Manzanita,** and also near midchannel westward of Dockton.

Many settlements and summer resorts are along the shores of the harbor, but the landing wharves, for the most part, are in disrepair.

Burton is a town on **Burton Peninsula** which projects eastward from the western side about 3 miles from the entrance. It has several stores and a wharf and float with a reported depth of 3 feet off the end. A marina here makes limited repairs; a hoist can lift craft to 4 tons and 30 feet in length; gasoline, lubricants, water, and groceries are available.

Dockton, in the bight on the eastern side about 2.5 miles from the entrance, is a village with a store. A wharf in poor condition is no longer used. There are ruins of two other wharves. There are several piling where log rafts are temporarily secured. The County Park, on the east side of the bight, has a public wharf and float for pleasure craft.

In the upper part of the harbor, northward of the Burton Peninsula, are several private wharves and floats.

Colvos Passage, on the western side of Vashon Island, extends about 11 miles in a general southerly direction, with an average width of 1 mile. The passage is free of dangers. The northern entrance is about 4.5 miles southwestward of Alki Point, and the southern entrance is abreast Point Defiance. The passage is used principally by tugs hauling logs for the sawmills. A midchannel course can be followed with safety. The passage is marked by lights.

The current in Colvos Passage favors a northerly set, and at times advantage is taken of this fact by vessels bound from Tacoma to Seattle. The current in the middle of Dalco Passage and along the southwest shore of Commencement Bay sets westward or northwestward almost continuously.

To obtain full advantage of the peculiar currents in Colvos Passage and connecting waterways, use should be made of the Tidal Current Charts, Puget Sound, Southern Part.

Point Southworth, on the western side of the northern entrance, is high and wooded.

Fragaria and **Olalla,** on the western shore of Colvos Passage, are small residential communities. Only isolated piling remain of their former wharves. A rock baring at half tide is reported to lie 400 yards northward of the former wharf at Olalla.

Cove and **Lisabeula,** on the eastern shore, are summer resort areas. Cove has a float for small craft; gasoline and water are available. The former wharf is in ruins. There are several piling formerly used as moorings for log rafts. The wharf at Lisabeula is in poor condition and is not used.

Tahlequah is a small residential community, with a store, on the southern end of Vashon Island between Neill Point and **Point Dalco.** An automobile ferry operates between Tahlequah and Tacoma.

Gig Harbor is an inlet about 1 mile long on the west side of the southern entrance to Colvos Passage abreast Port Defiance. A light is on the southern end of the sandspit, at the eastern side of the entrance, which makes out for 220 yards and constricts the entrance to less than 100 yards in width. A narrow 10-foot channel in the middle has currents of considerable velocity. Inside the entrance the basin has from 4 to 6 fathoms. The surrounding land, partially cleared of timber, slopes gently toward the shores, and is thickly settled.

The town of **Gig Harbor** extends along the western shore and the head of the harbor. It serves an extensive agricultural district and is the home port of many fishing boats. Log rafts are made up in the harbor. The town has two boatyards, each with marine railways. The larger of the two can handle vessels up to 250 tons. The second boatyard is smaller and specializes in yacht construction and repair. There are several landing wharves in the harbor, including three at which fuel, lubricants and fresh water may be obtained.

On entering Gig Harbor, hold midway between the spit on the eastern side and the western shore until just inside

the entrance. Then swing right toward the eastern shore until past the short spit extending from the western shore, and steer a midchannel course into the harbor.

Chart 6407.—Commencement Bay entrance lies 18 miles southward of Alki Point and 56 miles southward of Point Wilson. The bay is about 2.5 miles in length. The waters are deep throughout, ranging from 570 feet at the entrance to 100 feet at the head where they shoal abruptly to mudflats that bare. The bay is easy of access and free of dangers.

Tacoma, the second city in size and importance on the sound, occupies the southern and southwestern shores of Commencement Bay, and its residential area has grown northward into Seattle's southward suburbs, and to Steilacoom on the southwest.

The city has extensive waterborne commerce, both foreign and domestic; its exports include large quantities of lumber, ferrous metals, wheat, flour, machinery, and general merchandise. Much of the Alaskan trade originates here.

Prominent features.—Browns Point Light (47°18.4′ N., 122°26.6′ W.), 38 feet above the water, is shown from a white tower on the point; a fog signal is at the station. In the bight just northward of the point is a small settlement.

Dash Point and the village of **Dash Point** are a mile northeastward of Browns Point. There is a store at the foot of the long pier which extends out from the north side of the point to a depth of 20 feet.

Point Defiance, the western entrance of Commencement Bay, terminates in a very prominent dirt bluff, 160 feet high. A light and fog signal are just westward of the point. **Point Defiance Park** is wooded for a mile from the end of the point.

From the flats at the head of Commencement Bay, the city waterfront extends northwestward to within 1.5 miles of Point Defiance. Along here are numerous industrial plants with wharves to accommodate vessels drawing 30 feet or more.

The most prominent of these is a large ore smelter 2 miles southeastward of Point Defiance; it has a very high chimney, which is the most conspicuous landmark in the area, although the television tower, about a mile south-southwest of Ruston, is higher. Often the chimney can be seen in thick weather when the tower cannot.

A measured nautical mile, on course **132°05′,** is off the western shore, just below Ruston.

City Waterway is the westernmost of the channels at the head of the bay. Federal project depths in City Waterway are 29 feet to the Eleventh Street Bridge, thence 22 feet to the South Fourteenth Street Bridge, and thence 19 feet to the head of the project. Maintenance work is done when required on this waterway.

Over the waterway there are three drawbridges, the minimum clearance of which is 6 feet at the upstream railroad swing bridge. The Eleventh Street vertical-lift bridge has clearances of 64 feet down and 139 feet up.

See **203.785,** Chapter 2, for drawspan regulations.

Middle Waterway, northeastward of City Waterway, and **St. Paul Waterway,** northeastward of Middle Waterway, are not Federal projects. In Middle Waterway, the water area off all three sides of the outer wharf has been dredged to 32 feet. The upper part of the waterway has shoaled and is not navigable. St. Paul Waterway is used for log storage for the big papermill there.

Puyallup Waterway, northeastward of St. Paul Waterway, discharges the water of **Puyallup River.** The waterway has shoaled to such an extent that it cannot be used commercially. The highway lift span crossing the waterway has clearances of 26 feet down and 138 feet up. See **203.810,** Chapter 2, for drawspan regulations.

Milwaukee Waterway, northeastward of Puyallup Waterway, has depths of 30 feet or more. A light and fog signal are on the western side of the entrance. The railroads and several other commercial interests lease these facilities; a railroad car float ferry slip is here.

Sitcum Waterway, northeastward of Milwaukee Waterway, has depths of 23 to 40 feet; it is used for log storage and general cargo.

The next two channels, **Port-Industrial Waterway** and **Hylebos Waterway,** are maintained as a Federal project with depths of about 30 feet. The Eleventh Street bascule drawbridges over these waterways have clearances of, respectively, 14 feet and 21 feet. A light is off the edge of the shoal on the north side of the channel at the entrance to Hylebos Waterway.

Anchorage.—The depths as a rule are too great for convenient anchorage, but vessels occasionally anchor under the northern shore about 1 mile eastward of Browns Point. Vessels may anchor in about 60 feet 450 yards north-northwestward of the outer end of Puyallup Waterway west jetty. The city maintains one mooring buoy just eastward of the entrance to the City Waterway. It is in charge of the harbormaster.

City regulations permit anchorage in any part of the bay outside the harbor lines so as not to interfere with vessels arriving or departing from their docks.

Tides.—The mean range of tide at Tacoma is 8.1 feet. The range between mean lower low water and mean higher high water is 11.8 feet. A range of about 19 feet may occur at the time of maximum tides. The tidal currents in the harbor have little velocity.

See Appendix for **storm warning displays.**

Pilotage is compulsory for all vessels except those under coasting trade on the west coast of the United States, including Alaska and British Columbia. Pilots may be obtained from Puget Sound Pilots' Association, Seattle, on short notice.

Towage.—Tugboats are available at Tacoma.

Quarantine.—Vessels subject to quarantine inspection usually proceed to their docks, where they are boarded by the quarantine officer. Fumigation service is performed at the port, however advance notice of 24 hours should be given to the quarantine officer at Tacoma or the U.S. Public Health Service at Seattle.

Customs.—Tacoma is a port of entry; marine documents are issued.

Immigration officials are stationed at Tacoma.

The Coast Guard has a patrol boat stationed at the

municipal dock on the western side of City Waterway near Eleventh Street.

Harbor regulations are administered by the harbormaster who is the city fire chief; his headquarters are at the fire station at 823 A Street.

Speed.—It shall be unlawful for any vessel in fog, mist, falling snow, or heavy rainstorm, whether by day or night, to travel in excess of 6 knots on any of the waters of Tacoma Harbor. It shall be unlawful for any vessel in clear weather to travel in excess of 8 knots within 500 feet of the outer harbor line on any such waters.

Wharves.—Depths of 40 feet alongside are maintained by the Port of Tacoma at Pier 6 on Sitcum Waterway; the grain elevator on this facility has a capacity of more than 4,500,000 bushels. Alongside Piers 1 and 2, on Port-Industrial Waterway, depths of 35 feet are maintained by the port authority, over berthing lengths of more than 1,000 feet at each. There are gantry cranes and rapid bulk handling devices of the most modern type. Of more than 3,000 acres on the industrial harbor property, some 280 acres are being used for terminal purposes, and the port has nearly 1,200 acres in process of development for future expansion.

Supplies.—Bunker fuels, gasoline, lubricants, marine hardware, and provisions can be obtained in any quantity.

Repairs.—The largest repair yard in Tacoma can haul out vessels up to 1,000 tons for all kinds of repairs, including electronics, welding, painting, and machining; shafts up to 30 feet in length are machined here. Another plant does shipbuilding exclusively, but will perform topside repairs if needed. Wreckage and salvage facilities are available. Larger vessels go to Seattle for drydocking.

Minor repairs and services for small craft are available at marinas on the City Waterway and on the northeastern shore of Commencement Bay.

Communications.—Tacoma is served by four railroads, by three commercial airlines, and by bus lines to all parts of the country. Many foreign and coastwise vessels call.

Chart 6460.—Southward of Point Defiance there are numerous inlets, passages, and islands. At many of the villages the landing wharves have fallen into ruins, all transportation following the highways. These waters are navigated by log tows and by pleasure craft. Deep-draft vessels call at Olympia for lumber and other forest products. The depths are generally great and the dangers are few. The shores are well wooded and moderately low. The beaches are sand and gravel, with boulders in places, and are often backed by steep, bare sand and gravel bluffs. Olympia is the only city, but there are several smaller settlements. Strangers bound through these waters at night are advised to take a pilot.

Currents.—In The Narrows current velocities exceed 5 knots at times. At the north end of The Narrows the current sets northward most of the time on the east side of the passage and southward most of the time on the west side.

Daily current predictions for a midstream position near the north end of The Narrows and details of the current movement at other locations are contained in the Tidal Current Tables. These tables and the Tidal Current Charts, Puget Sound, Southern Part, should both be consulted for details of the complicated currents of this area.

Vessels en route to Olympia or Shelton, if meeting the ebb current from The Narrows, round Point Defiance close aboard, but if going with the flood, stand out and hold midchannel course well off that point. Craft from northward through Colvos Passage keep to a general midchannel course.

From Point Defiance to near Days Island Anchorage, the eastern shore of The Narrows consists of high, bold bluffs. A tunnel is 1.8 miles southeastward of Point Defiance; from it a railroad track follows the shoreline to Nisqually River. The western shore is broken by inlets and passages which afford communication to small settlements devoted to lumbering or agriculture.

Point Evans, 2 miles southward of Point Defiance on the west side of The Narrows, is marked by a light. Power cables with a clearance of 200 feet cross 200 yards southward of the point. A highway suspension bridge is a mile southward of the point; clearance is 159 feet.

Days Island Anchorage, at the suburban town of **Titlow Beach,** is about 4.5 miles southward of Point Defiance. The ferry slip and wharf are no longer used. Gasoline, lubricants, and moorage are obtainable at two marinas; one on Days Island and the other just to the eastward on the mainland. The former has a 15-ton launching crane. Hull and engine repairs can be made. See Appendix for **storm warning display.** A 2¾-fathom shoal lies 230 yards westward of the former ferry slip.

A small-boat channel, 1 foot deep, leads into **Days Island Lagoon.** The channel favors the Days Island side and under the bridge it is 30 yards from the island shore. Local boats anchor in 3 feet in the lagoon. Anchorage for small boats may be had eastward of the northern end of Days Island.

Three miles southward of Days Island Anchorage, the shores consist of bright bare bluffs which are prominent from southward.

From here the route to Olympia continues southwesterly and westerly through **Balch Passage,** Drayton Passage, and Dana Passage, thence southerly into Budd Inlet. This route is deep and generally free of dangers.

Hale Passage, between **Fox Island** and the mainland, enters on the western shore 5 miles southward of Point Defiance. It is 4 miles in length to its junction with Carr Inlet. Near the western end the passage is crossed by a fixed highway bridge with a clearance of 31 feet. A shoal about 0.8 mile eastward of the northern end of Fox Island near the middle of the passage is boulder-strewn and bares. A 1-fathom kelp-marked shoal is 200 yards eastward of Grave Island. A good small-boat anchorage is available on either side of Grave Island. The tidal current attains velocities of 2 to 3 knots at times. The eastward (ebb) current is stronger than the westward. Current predictions may be obtained from the Tidal Current Tables.

Sylvan is a village in the small cove near the north-

eastern end of Fox Island. It has a store and service station. There are several small private wharves. **Grave Island,** in the center of the cove, has a boys' camp, the buildings of which are prominent. A structure resembling a lighthouse is on the extreme northern end of the island. The former ferry slip, about a mile to the southeast of Sylvan, is in ruins.

Wollochet Bay is a small inlet about 2 miles long extending northward from Hale Passage, about 1 mile inside the eastern entrance. The upper part is narrow and shoal. It affords an anchorage in midchannel about 0.3 mile inside the entrance in 11 to 12 fathoms, sticky bottom. The Tacoma Yacht Club maintains holiday moorings near the head of this bay.

Gibson Point, the southern tip of Fox Island and the northern entrance point of Carr Inlet, is marked by a light. **Toliva Shoal,** nearly in midchannel about 8 miles southward from Point Defiance, consists of two rocks covered 1¾ fathoms, marked by a lighted bell buoy. The shoal may be passed on either side, giving the buoy a berth of 300 yards.

Carr Inlet enters the western shore of the sound about 8 miles southward of Point Defiance. From the entrance, between Fox and McNeil Islands, it extends about 6 miles west-northwestward and then trends northward for 8 miles, terminaitng in flats at the head. Good anchorage is available in the upper reaches in 6 to 15 fathoms, soft bottom, and in several small coves on its southern and eastern shores. From the entrance, a midchannel course is safe.

A **naval restricted area** is in the southerly part of Carr Inlet; see **207.750,** Chapter 2, for limits and regulations.

Gertrude is a village on the southern side of Carr Inlet on the shore of **Still Harbor,** which is a bight on the northern side of McNeil Island southward of **Gertrude Island.** It has a landing in 10 feet of water. The bottom in the middle of Still Harbor is uniform, with 8 to 9 fathoms, sand and mud bottom. The bottom slopes gradually to a flat of sand and gravel at the head of the bay eastward of the wharf at Gertrude.

Wyckoff Shoal, part of which bares, extends 0.8 mile westward from the northwestern part of McNeil Island. A winding channel of 2 fathoms, between Wyckoff Shoal and McNeil Island, is used with local knowledge.

Pitt Passage, westward of McNeil Island, connects Drayton Passage and Carr Inlet. It is obstructed about midway of its length by **Pitt Island** and its surrounding rocks and shoals. Only the passage east of Pitt Island is used by small craft with local knowledge. In this passage the ebb (northward current) is stronger than the flood and attains a velocity of 2.5 knots or more at times.

Lakebay in **Mayo Cove** on the southwestern shore of Carr Inlet, is a village with a store, and service station. There are several small private wharves and a float landing here. The cove is shoal except in the middle near the entrance. The channel to the landing is difficult to navigate, and strangers are advised to proceed cautiously or to obtain local advice. **Home,** a village on the western side of **Von Geldern Cove,** is known locally as **Joes Bay.** It has a store, service station, and float landing. A sandspit extends out from the eastern shore of the cove.

Glencove is a small settlement in Glen Cove on the western side of Carr Inlet, about 5 miles north-northwestward of South Head. It is a summer recreational area with a private wharf and float. At the head of the cove are log booms.

Wauna is a village at the head of Carr Inlet, where the spit enclosing **Burley Lagoon** joins the mainland. A county road extends along the spit and across the entrance to the lagoon over a fixed highway bridge to Rosedale and Gig Harbor. The bridge has a clearance of 12 feet.

Rosedale is a residential community on the cove on the eastern side of Carr Inlet, eastward of **Raft Island,** which is 180 feet high. There is an extensive shoal area around and between Raft and **Cutts Islands.** The shores of these islands are strewn with boulders. A fixed highway bridge and overhead cable extend from the southerly side of Raft Island to the mainland. The bridge clearance is 17 feet, and the cable, 48 feet.

Horsehead Bay, about 1 mile in length, is directly northward of Green Point, at the western extremity of Hale Passage. This is a residential area with several private wharves.

The Federal penitentiary, on the southeastern side of **McNeil Island** about 0.8 mile southwestward of **Hyde Point,** is prominent when approaching. The wharf, built out to 16 feet, is lighted by a row of lights. Fresh water is piped to the end of the wharf. **Bee** is an automobile ferry landing on the south side of McNeil Island 1 mile westward of the penitentiary. The ferry connects with Steilacoom and **Anderson Island.**

Eagle Island, small and wooded, is near the middle of Balch Passage, 0.2 mile from Anderson Island, and is marked on its northern end by a light. On the shores of Anderson Island, southward of Eagle Island, are private float landings.

Eagle Island Reef, 300 yards westward of Eagle Island, bares 1 foot at its southern part and has a depth of ½ fathom at its northern part. A buoy is off the northwestern part of the reef.

Drayton Passage, westward of Anderson Island, is about 3 miles long in a northerly direction; it connects with Pitt Passage and Balch Passage, at its northern end, and at its southern end joins the western part of Nisqually Reach. With the exception of a spit extending 0.2 mile from the western shore, marked by a light, the waters are deep and free of dangers. Estimated current velocities of 1 to 2 knots occur at the southwestern end of the passage.

Filucy Bay, on the western shore opposite Balch Passage, is about 1.5 miles long and irregular in shape; it is 0.4 mile wide at the entrance. **McDermott Point,** the spit at the southern side of the entrance, is marked by a conspicuous tower. Good anchorage in 7 to 8 fathoms, muddy bottom, is available inside. There are numerous houses around the shores of this bay. **Longbranch,** a village in the small cove opposite the entrance, has a service station,

stores, and a garage. The wharf, with 9 feet at the end, has a float for small craft. There is a log dump in the cove.

Steilacoom is on the mainland about 9 miles southward of Point Defiance. The town is of little commercial importance; a limited amount of groceries can be obtained. It has rail facilities and a wharf from which a ferry service is maintained to Anderson, McNeil, and Ketron Islands. Indifferent anchorage may be had along the waterfront close inshore, but it is not recommended as the holding ground is poor and the currents have considerable velocity. Off Steilacoom there are tide rips which, with a wind opposing the current, are dangerous to small boats. **Chambers Creek,** 1 mile northward of Steilacoom, has small lumber mills and a sand and gravel works. Except for the towing of log rafts, shipments are made by rail and truck.

Ketron Island, 10 miles southward of Point Defiance and eastward of Anderson Island, is a small, narrow island which is privately owned. It is heavily wooded with bluff shores, except at its northern end where there is a wharf for small craft. **Cormorant Passage,** 0.5 mile wide, separates the island from the mainland southward. The passage is clear but is little used.

Nisqually Reach trends southward and westward around Anderson Island to Case Inlet. The southern shore is formed by the **Nisqually River** flats which at low water are bare for nearly a mile offshore. The edge of the flats is bold with deep water close-to; a buoy marks the flats.

Oro Bay, in the southeastern part of Anderson Island, is an irregular bight between **Cole** and **Lyle Points.** Most of the bay is shallow; it affords an indifferent anchorage in about 10 fathoms, but is affected by the currents and affords little protection. A small shallow arm extends about 1 mile northwestward on the western side of the bay. A wharf built out to 7 feet on the western side of this arm serves **Vega,** a small village. An anchorage for small craft is here.

A powder works wharf, built out from the mouth of **Sequalitchew Creek,** 13 miles southward of Point Defiance, has a depth of 23 feet alongside. The plant is a short distance inland and cannot be seen from offshore. Another powder plant wharf is about 1.5 miles northwestward of **Nisqually Head,** west of Nisqually Flats; there is a depth of about 24 feet alongside.

Devils Head, the western point at the southern entrance of Drayton Passage, is 280 feet high and heavily wooded.

Johnson Point, 2 miles westerly of Devils Head, is 90 feet high. A light and fog signal are on the sandspit at the end of the point.

Local magnetic disturbance.—Differences of as much as 3° from normal variation have been observed along Henderson Inlet.

Itsami Ledge, covered 1 fathom, lies 1 mile southwestward of Johnson Point. It is surrounded by kelp and marked by a light. This is a danger in entering Henderson Inlet or Dana Passage.

Henderson Inlet, locally known as **South Bay,** immediately westward of Johnson Point, extends about 4.5 miles in a southerly direction; the southern part is an extensive flat. Good anchorage is inside the entrance in 5 to 6 fathoms, muddy bottom. A spit makes out about 0.2 mile northward from the western point at the entrance; on the western shore, 0.8 mile southward of the entrance point, is a long sandspit. There is a railroad log dump with booming grounds on the western side. Oyster beds abound in the southern area of the bay.

Case Inlet, a popular sport fishing and resort area, extends some 14 miles northward from Johnson Point. The flats at its head are only 2 miles from the head of Hood Canal. Depths are irregular, from 10 to 30 fathoms, but there are no offlying dangers.

Hartstene Island forms the west side of the southern part of the inlet. **Herron Island,** about 4 miles north of the entrance and 0.3 mile west of the eastern side, is a popular summer resort, with moorings for small craft. A ferry connects with the mainland at the village of **Herron.** The bar between the north end of Herron Island and the eastern shore has a least depth of about 13 feet, but with local knowledge a depth of 21 feet can be carried through by rounding the northeastern tip of Herron Island some 300 to 500 yards off.

Good anchorage may be had anywhere northward of Hartstene Island, in 6 to 15 fathoms, muddy bottom.

There are numerous farms and several small settlements whose chief industries are oyster culture, farming, and some logging. The flats near the head of the inlet are largely covered with oysterbeds.

Pickering Passage indents the western shore of Case Inlet, about 2 miles northwestward of Herron Island. The passage extends in a general southerly direction for 8 miles, connecting at its southern end with Peale Passage and Totten Inlet. The shores are generally low and wooded, and the depths vary from 5 to 15 fathoms. Except for the shoals extending eastward from the mouth of Hammersley Inlet, the passage is free of outlying dangers, and a midchannel course is safe. In Pickering Passage the flood current sets from Case Inlet toward Hammersley Inlet and the ebb in the opposite direction. The strongest currents are near the southern end where velocities reach 2.5 knots at times. The settlements are served by highway. An automobile ferry provides communication with Hartstene Island at **Grant,** about 3.5 miles northward of Hammersley Inlet.

Stretch Island is near the western shore of Case Inlet, just northward of the entrance to Pickering Passage. There is no through channel westward of this island. The northern part of this island is partly cleared of trees and laid out in orchards; a winery and several grape juice factories are here. There is a private landing wharf built out to 12 feet on the northern end of the island. A fixed highway bridge connects the mainland. **Grapeview** is a village opposite Stretch Island. It has a store and service station.

Reach Island, 0.2 mile northward of Stretch Island, has been subdivided for homesites and is known as **Treasure Island.** It is separated from the western shore by a shallow channel known locally as **Fair Harbor.** The channel is spanned by a fixed bridge with a clearance of 16 feet. A rock that bares 5 feet is near the middle of the passage back of Reach Island. The through channel is westward of the rock and has a controlling depth of 1 foot. To avoid the rock, favor the western shore.

Vaughn is a thriving village on the north shore of **Vaughn Bay,** which lies on the east side of the inlet about 4 miles from the head. The wharf is in ruins. A channel 2 feet deep leads to deeper water in the bay. Follow the northern shore for 200 yards after entering in midchannel off the end of the spit; then cross the bay parallel with the spit at a distance of 200 yards, heading toward the southern shore; then follow the southern shore at a distance of 200 yards, steering toward the head of the bay. Around the shores are numerous houses and orchards, and extensive log booming areas.

Rocky Bay is the shallow inlet northward of Vaughn Bay. A float landing, in 10 feet of water northward of Windy Bluff, is used at low tide when Vaughn Bay cannot be entered. A channel 3 feet deep leads to the lagoon back of the sandspit near **Windy Bluff.** It is necessary to come around the small sand island northward of the spit. Oysterbeds are in the eastern side of the bay northward of the spit.

Allyn is a village on the western side of Case Inlet near the head about 0.5 mile northward of **Sherwood Creek.** A draft of 7 feet can be carried to the oyster wharf at Allyn.

Peale Passage, about 4 miles long, extends northwesterly between Hartstene and Squaxin Islands, and connects with Pickering Passage. It has a controlling depth of about 13 feet in midchannel. Strangers should not attempt it. The current at times attains a velocity of 1.5 knots in the narrow part of the passage, and sets northward on the flood.

Chart 6462.—Dana Passage, between **Brisco Point,** the southern point of Hartstene Island, and the mainland, is about 2 miles long. It is the main route to Budd Inlet and Olympia, and also joins with three other bodies of water: Eld Inlet, Squaxin Passage, and Peale Passage. Squaxin Passage leads to Totten and Hammersley Inlets, and Peale Passage leads to Pickering Passage.

With the exception of Itsami Ledge near its eastern end, Dana Passage is clear and a midchannel course may be safely followed. The currents in Dana Passage frequently attain velocities of 3 knots or more.

Boston Harbor, a village in the cove of the same name just east of Dofflemyer Point, has a launching ramp and a pier with a mooring float for small craft. Gasoline and supplies for sport fishermen may be obtained.

Budd Inlet, 27 miles from Tacoma, is about 6 miles in length, extending southward from Dana Passage and terminating in flats that bare. The entrance is between Cooper Point and **Dofflemyer Point,** the latter marked by a light and fog signal. The entrance to Budd Inlet is deep except for the 28-foot shoal in the middle of the entrance. The shores are comparatively low and wooded, and the depths shoal less abruptly on the eastern than on the western side of the inlet. The southern half of the bay is obstructed by flats and shoals that bare for 0.8 mile, through which channels have been dredged to the Olympia waterfront.

Olympia, the capital of the State of Washington, is a major port at the head of Budd Inlet. Lumber and logs comprise over 70 percent of the waterborne traffic of the port.

Prominent features.—The capitol dome and the twin black stacks on the plywood plant in the southeastern part of the harbor are the most conspicuous objects visible on the approach from the inlet entrance.

Channels.—Federal project depth in the channel to Olympia is 30 feet. The channel is marked by lights, buoys, and ranges.

Anchorage.—Good anchorage may be had anywhere inside the entrance in muddy bottom.

Dangers.—Olympia Shoal, which bares, is about 0.4 mile off the western shore, 3 miles inside the entrance. A light is on the eastern side of the shoal, and on its west side are lights marking the approach to the dredged channel. There are numerous shoals, piles, dolphins, and log booms on the eastern side of the harbor.

A **restricted area** for berthing of Maritime Commission vessels is on the easterly side of the inlet; limits and regulations are given in **207.900,** Chapter 2.

Southeastward of Olympia Shoal is a **measured course,** 6,201 feet long, on bearing 357°15′. Olympia Shoal Light and Olympia Channel Light are the markers.

Tides.—The mean range of the tide at Olympia is 10.5 feet while the range between mean lower low water and mean higher high water is 14.4 feet.

Pilotage is compulsory for all vessels except under coasting trade on the west coast of the United States, including Alaska and British Columbia. Pilots may be obtained from Puget Sound Pilots' Association, Seattle, on short notice.

Towage.—Tugboats of any size required are available at any time.

Quarantine.—Vessels usually go to their docks for quarantine inspection. Fumigation service is available at the port; however, advance notice of 24 hours should be given to the quarantine officer at Olympia or the senior surgeon of the U.S. Public Health Service at Seattle. The Public Health Service maintains an outpatient office in Olympia. Hospital cases are sent to Seattle.

Customs.—Olympia is a port of entry. A deputy collector of customs maintains an office at the port terminal. There are neither customs nor bonded warehouses in Olympia.

Wharves.—The eastern side and end of the main dredged channel is the only part of Olympia Harbor with public wharves. The port terminal, the principal wharf, is 2,000 feet long, with berthing space for its full length and a depth of 35 feet alongside, maintained by the Port

of Olympia. The industrial plants, chiefly lumber mills, are in the shallower portions of the harbor along the western and southeastern shores. The products from this location are moved either by lighters to vessels or by trucks or cars to the port terminal. The oil wharf northward of the port terminal has a depth of 35 feet at its face. Floats for small craft are maintained at several places in the harbor, and a marina at the northerly end of the Port of Olympia has an elevator lift, and provides minor repairs and hardware for small craft.

Supplies.—Water, ice, groceries, and some marine hardware can be obtained. Diesel oil, gasoline, and lubricants are available.

Repairs.—There is a marine railway and a gridiron large enough for small boats. Emergency repairs can be handled by local machine shops, a welding works, and a boiler works. Larger vessels go to Tacoma or Seattle.

Communication.—Olympia is served by two transcontinental railways, and several foreign and domestic steamship lines. The municipal airport is 4.5 miles southward of the city.

Chart 6460.—Eld Inlet, locally known as **Mud Bay,** immediately westward of Budd Inlet, is of little commercial importance. It affords good anchorage inside the entrance in 24 to 42 feet, soft bottom. A midchannel course is clear to the flats at its head. In entering, **Cooper Point,** the eastern point at the entrance, should be given a berth of not less than 0.2 mile. Some logging and oystering are done here.

Squaxin Passage, southward of **Squaxin** and **Hope Islands,** is about 1 mile in length and leads to Totten and Hammersley Inlets. A light on Hunter Point marks the southwestern entrance point of the passage. The northern shore is foul; a shoal covered 19 feet is 150 yards off the western shore of Hope Island abreast Steamboat Island.

The passage is narrow, and strangers should proceed with caution. The southern shore should be favored, and at the western end, the northern point of Steamboat Island should be favored. Tide rips are said to occur in the passage. The usual velocity of the current is about 1.5 knots.

The passage between Hope and Squaxin Islands has a least depth of 9 feet in the middle. A reef that bares at extreme low water, southeastward of Hope Island, is easily avoided in Squaxin Passage by keeping the northern point of Steamboat Island well open of the southern point of Hope Island.

Steamboat Island, a major summer resort, is connected with **Carlyon Beach** on the mainland by a roadway on piling. The roadway is in poor condition and used as a footwalk only. The island is practically a part of the mainland. The northwestern end of the island terminates in a long sandspit. On the eastern side of Carlyon Beach is a large building with a float landing.

Totten Inlet extends 8 miles southwestward from the western end of Squaxin Passage. A depth of 30 feet can be carried to a point off the entrance to Skookum Inlet. A 3½-fathom shoal is about in midchannel at the entrance, 620 yards southwestward of the southern end of Steamboat Island. A spit extends westward for about 100 yards from Steamboat Island. In entering, favor the western shore to avoid the spit and shoal. The inlet shoals gradually to near **Burns Point,** 100 feet high, on the southern shore, where it bares at low tide.

Oyster Bay, southward of Burns Point, is an extensive mudflat; oysters are grown in this area, and there are log booms. Southward of the entrance to **Skookum Inlet,** along the shores of Totten Inlet, are rock or concrete walls enclosing the oysterbeds. The walls are a danger to navigation, and the oyster industry discourages boatmen from entering these waters. Oyster-processing wharves are on the northern side of the inlet. Local knowledge is required to get to them. Good anchorage may be had anywhere inside the entrance of Skookum Inlet.

Chart 6461.—Hammersley Inlet indents the western shore of the sound about a mile northward of the western end of Squaxin Passage. It is about 6 miles in length, expanding at its head into **Oakland Bay,** which is 3.5 miles long in a northeasterly direction. The inlet is obstructed by shoals, particularly at its mouth, where there is an extensive bar. The shoals have been partly removed.

The controlling depth in the channel to the town of Shelton is about 10 feet. It is navigated only by light-draft vessels, and by tugboats with log rafts and railroad car floats; local knowledge is required. Tidal current velocities may reach 5 knots at times in the constricted parts of the inlet. Current predictions may be obtained from the Tidal Current Tables. Vessels enter on the flood, usually after half tide, and leave on the ebb, usually before maximum strength. Hammersley Inlet is considered dangerous for strangers.

Vessels with sharp rise of bilge should avoid the inlet as there is danger of capsizing in the strong current in case of grounding.

Arcadia is a small settlement on the southern point of the entrance of Hammersley Inlet. It has a public ramp for launching small pleasure craft. A light is on the point southeastward of Arcadia.

Shelton, at the head of the inlet, is a town of some commercial importance. Extensive logging and lumber interests are centered here. It is on the branch of the Northern Pacific Railway; lumber is shipped by rail only. Some railroad car ferrying is done. Railway trestles used as log dumps extend across the flats. An oil wharf on the northern shore extends out to a depth of 12 feet. Several floats, just southward of the wharf, accommodate small craft. Communication with Olympia is by rail and bus. Gasoline, diesel oil, and some supplies can be obtained. Oysters are cultivated in the shoal portions of **Oakland Bay.**

14. HAWAII

HAWAII (Chart 4000), a Polynesian kingdom until 1893 and then briefly a republic, requested and was granted annexation to the United States in 1898 and was given a territorial form of government in 1900. By Presidential proclamation of August 21, 1959, Hawaii officially became the 50th of the United States.

The **Hawaiian Archipelago** is a group of eight large islands, plus many islets, reefs, and shoals, strung out from southeast to northwest for 1,400 nautical miles in the north-central Pacific Ocean. The archipelago extends from 154°49′ to 178°20′ west longitude and from 18°55′ to 28°25′ north latitude, straddling the Tropic of Cancer. All the islands of the archipelago except 3-square-mile Midway are part of the State of Hawaii.

The capital and chief population center of the State is Honolulu on the island of Oahu; the port is 2,091 nautical miles from San Francisco, 4,685 miles from the Panama Canal, and 2,373 miles from Seward, Alaska. Land area of the State totals 6,424 square statute miles, of which the "Big Island" of Hawaii alone accounts for nearly 63 percent. The other seven large islands are, in order of size, Maui, Oahu, Kauai, Molokai, Lanai, Niihau, and Kahoolawe.

The major islands are mountainous and of volcanic origin; the Island of Hawaii has two volcanoes that are still active. Elevations range from sea level to nearly 14,000 feet, with many peaks in excess of 2,500 feet. Although coastal plains, valley floors, and certain plateaus are relatively flat, much of the surface is quite rugged, with high ranges and deep ravines or gorges.

Nearly all of the island streams may be classified as mountain torrents, although some of them can be navigated for short distances by small boats. Most of the streams are on the north and east coasts where rainfall generally is heaviest.

The 20-fathom depth curve is seldom more than a mile from shore and usually is not far from the coral reefs that fringe much of the island coastline. The bottom generally pitches off rapidly to great depths from a narrow coastal shelf, and the few off-lying dangers usually are indicated by breakers or by a change in color of the water.

Agriculture is HAWAII's bedrock industry. Sugar exports total over a million tons annually, and the State produces and exports well over half of the world's output of canned pineapple. Truck farming is intensive, particularly on the Island of Oahu, and cattle ranches range from small to very large (one of the largest cattle ranches in the United States is on the Island of Hawaii). Military expenditures and tourist trade are major sources of income.

Geographic names.—Following are the English meanings of Polynesian words that occur frequently in Hawaiian geographic names.

Ana	cave
Awa	harbor
Hale	house
Heiau	temple
Hono	harbor
Kai	sea
Kapu	prohibited
Kona	south
Koolau	north
Lae	cape
Lapa	ridge
Loko	pond
Lua	crater
Mauna	mountain
Moana	ocean
Moku	islet
Pali	cliff
Pele	volcano
Puu	hill
Wai	water
Wailele	waterfall

Harbors and ports.—Honolulu is by far the largest commercial deepwater facility in Hawaii. Other commercial deepwater harbors are Hilo and Kawaihae on Hawaii Island, Kahului on Maui, and Nawiliwili and Port Allen on Kauai. These ports service both overseas and interisland shipping.

Commercial barge harbors, engaged exclusively in interisland shipping, are Kailua on Hawaii Island, Hana on Maui, Kaumalaupau on Lanai, and Kaunakakai, Haleolono, and Kalaupapa on Molokai. These harbors service only light-draft vessels.

Boundary lines of inland waters.—At all buoyed entrances from seaward to bays, sounds, or rivers for which specific lines are not described, Inland Pilot Rules apply shoreward of the outermost buoy or other aid to navigation of any system of aids; International Pilot Rules apply outside the aids. **See Part 82, Chapter 2, for specific lines.**

Control over movement of vessels.—Regulations require advance notice of vessel's time of arrival to Captain of the Port; **see Part 124, Chapter 2.**

Anchorages are numerous except on the northerly and easterly sides of the islands where shelter from the trade winds is a major requirement. The anchorages on the southerly and westerly sides of the islands are unsafe during kona weather.

Tides.—The periodic tides around Hawaii average only 1 to 2 feet. The tides along the northern coasts usually occur about 1 to 1½ hours earlier than the tides along the southern coasts. See Tide Tables for daily predictions of times and heights of high and low waters.

The effect of strong winds added to normal tidal action may cause water level to fall considerably below chart datum and/or rise considerably above mean higher high water. A heavy surf, particularly from northward, gives the impression of higher tides on the exposed beaches; there is usually little actual increase under such conditions. On the south side of Oahu, where the trades usually blow directly off the land, a shift to kona winds or to a calm has been observed to raise the tide level a few tenths of a foot.

Currents.—The variable oceanic currents in the vicinity of Hawaii are believed to depend mostly upon the velocity and direction of the wind, but there are many reports of strong northeastward currents setting against the prevailing trades. There is a prevailing westward oceanic drift in the vicinity of the larger islands and as far west as Necker Island.

The tidal currents are generally rather weak and are influenced by winds and oceanic movements. Such currents are mainly reversing in the channels between the larger islands, but they are rotary in more open waters, particularly around the western islets, and shift direction continuously in a clockwise movement.

Seismic sea waves.—The Hawaiian Archipelago has been visited from time to time by seismic sea waves which caused enormous destruction. Loss of life and property can be lessened by intelligent response to warnings that such waves are imminent; see Chapter 1 for basic discussion.

The Coast and Geodetic Survey administers a sea-wave warning system that alerts the Hawaiian Islands, other Pacific islands, and most of the countries bordering the Pacific. The system has an operating center at the Honolulu Observatory on Oahu and includes scattered seismograph stations for quick detection and location of submarine earthquakes, a network of wave-detecting and reporting stations throughout the Pacific, a high-priority communication setup, and an extensive international arrangement for broadcasting warnings of possible sea waves.

Military authorities in Honolulu will issue warnings to all military bases that might be affected. Local base commanders will put into effect any precautions deemed necessary. Elsewhere warnings will be broadcast by civilian authorities. Disaster committees have been set up on all the major islands to alert the population and to assist in evacuation and rescue as needed. In Honolulu and Hilo, former air raid sirens now operated by the police department will be used. On Oahu, Civil Air Patrol planes equipped with sirens will fly the shoreline and sound the alarm. This service will later be extended to the other islands. On all the major islands police cars equipped with sirens will patrol the coastal areas. Local commercial broadcasting stations will interrupt all programs to give the latest information and instructions. Should a warning occur when a radio station is closed down it will come on the air immediately and remain on until the all clear is sounded. When an alarm is given, all persons are warned to turn on their radios to a local broadcasting station for information and instructions. If they have no radio and cannot find access to one nearby they should seek high ground. Telephones are apt to be flooded with calls and therefore cannot be relied on during a warning.

When a warning is received, persons should vacate waterfront areas and seek high ground. The safest procedure for ships will depend upon the amount of time available and this may not always be known. A ship well out at sea would ride such waves safely, and hence if time is available to put to sea, that would be the safest action. During the 1946 wave, the master of a ship lying offshore near Hilo felt no unusual waves though he could see great waves breaking on the shore. Crews of fishing boats in the Hawaiian area also reported no unusual conditions at that time. On the other hand, the crew of a ship in the harbor may have a difficult time averting serious damage.

The destructive force is usually greater on the sides of the islands facing the oncoming waves, but this directional effect is frequently lacking and the waves may reach their greatest heights on the leeward sides of the islands. The waves may also attain great heights in funnel-shaped bays and at capes or other places where a submarine ridge projects seaward toward the oncoming wave. Unusual heights may be attained at any place where two waves traveling different paths arrive at the same time to reinforce each other. There is still much to be learned about these waves and the best policy is to avoid them in any way possible.

WEATHER.—The Appendix includes climatological tables for Honolulu, Hilo, and Lihue. Also listed are the Weather Bureau office, storm warning displays, and radio stations which transmit weather information.

General.—The climate of the Hawaiian Islands is unusually pleasant for a tropical area, the result principally of the marked marine influence and the persistent trade winds. Considering the latitude of the islands there is relatively little uncomfortable heat. The discomfort that is occasionally experienced usually occurs when the trades are temporarily displaced by light variable or southerly winds which are accompanied by comparatively higher humidities. The outstanding climatic features of the islands are the dominant trade-wind influences throughout all seasons, the remarkable variation in rainfall over adjacent areas, and the uniform temperature regime which varies slightly throughout the year.

During the summer season the trades blow with a high degree of persistency. As a result uncomfortable periods are usually delayed until fall and thus follow by weeks or possibly as much as two months the period when the highest temperatures occur. Rains most frequently fall at night.

Thunderstorms are infrequent and practically never severe. Hail seldom occurs. Occasionally local storms are accompanied by winds of sufficient force to do limited

damage, but severe storms such as hurricanes or tornadoes are rare. So-called thick weather is almost unknown to the extent of seriously interfering with shipping and is usually confined to mist and rain rather than being in the form of fog. Except for rare one or two day disruptions of interisland airplane schedules, interference to shipping or travel because of bad weather is almost unknown.

Pressure and general circulation.—The strongest influence in the pressure pattern underlying the general circulation of air over the Hawaiian Islands area is the persistent and semipermanent high-pressure cell known as the Pacific HIGH. The clockwise circulation around this cell coupled with a slight deflection of the surface winds away from the high pressure, result in the northeast trades that are the dominant winds of the area.

Winds.—The trade wind influence is dominant in all seasons throughout the greater part of all the islands. In some local areas winds deviate from the general pattern because of topography. In coastal areas where mountains to the east project high above sea level as they do in the Kona districts of the island of Hawaii the trades are cut off, resulting in prevalent southwesterly winds with land and sea breezes in evidence. Such effects may be rather general in some areas and extremely local in others.

Tropical storms.—The ocean rectangle included between 15° and 30° N. and 150° and 180° W. can hardly be characterized as subject to tropical storms, although a few moderate to severe storms of this character have occurred in the area.

There are at least three classes of tropical storms. One type includes a very scanty number from low latitudes and east longitudes which cross the 180th meridian on an eastward course. Late in the year, from October through about December, typhoons occasionally form very far to the eastward of their usual zone of prevalence and move strongly northward. The second type appears to form, though rarely, somewhere to the southward or southwestward of the long stretch of the Hawaiian Islands and to travel northward. The third type forms off the west coast of Mexico and moves to the west or northwest. Unlike the other storms, all of which are likely only during the period of October through April, these occur mostly in summer or early fall. So far as is known, this type of tropical storm is quite rare and any effect upon the Hawaiian Islands, other than increasing the strength of the trade winds, is still more rare.

Kona weather.—The word "Kona" is of Polynesian origin and means leeward. It refers to the southerly winds and accompanying weather on the normally leeward slopes of the principal Hawaiian Islands which, because of the wind shift, have temporarily become the windward slopes.

The Konas, which occur most frequently during the months of October through April, provide the major climatic variations of the Hawaiian Islands. During these storms heavy rainfal and cloudiness can be expected on the lee sides of coasts and slopes which, under the usual wind pattern, receive less cloudiness and may have almost no rain. Near gales may occur, especially near points where the air tends to funnel into sharp mountain passes located near the coasts. At such times leeward anchorages may become unsafe for smaller craft.

Precipitation.—The complicated rainfall pattern over the islands results chiefly from the effects of the rugged terrain on the persistent trade winds. Frequent and heavy showers fall almost daily on windward and upland areas while rains of sufficient intensity and duration to cause more than temporary inconvenience are infrequent over the lower sections of leeward areas.

In the districts where the trade winds are dominant, rains are decidedly heavier at night than during the day. This applies generally to the greater part of the islands. Daytime showers, usually light, often occur while the sun continues to shine.

Considerably more rain falls from November through April over the islands as a whole than from May through October. It is not unusual for an entire summer month to go by without measurable rain falling at some points on the Maui isthmus; at times considerably longer dry periods may occur in that locality.

Temperature.—Elevation is the major control factor in determining temperatures, although location, whether in a leeward or windward position, is also a noticeable factor. The highest temperatures reached during the day in leeward districts are usually higher than those attained in windward areas. The daily range is also greater over leeward dictricts where, because of less cloudiness, the maximum temperatures are higher and the minimum temperatures usually lower.

August and September are the warmest months and January and February are the coldest. At Honolulu there is an average monthly range between a low of 72° in January and February and a high of 78.5° in August. The extreme range of temperature at Honolulu for the 39-year period of record is from a low of 57° for January to a high of 88° recorded in August and September. This spread of only 31° between the extreme high and extreme low temperatures is small when compared with ranges at Pacific coast ports.

Humidity.—All coastal areas are subject to the relatively high humidities associated with a marine climate. Humidities, however, vary considerably, with high percentages over and near the windward slopes to low percentages on the leeward sides of the higher elevations.

At Honolulu the normally warm months of August and September are usually comfortable because of the persistency of the northeasterly trades which bring moderate humidities. Unpleasant weather is more likely later during the autumn or early winter when the trades may diminish and give way to southerly winds. During these periods known locally as "Kona weather" ("Kona storms" when stormy) the humidity may become oppressively high.

Routes.—Between the islands, proceed on rhumb lines as direct as safe navigation permits.

Honolulu to Panama.—Rhumb lines through 21°14′ N., 157°39′ W., and 21°18′ N., 157°00′ W.; thence great circle to 8°40′ N., 88°00′ W., off shoals reported south of Guardian Bank; thence rhumb lines through 7°05′ N., 81°45′ W.

Honolulu to San Diego, Los Angeles, San Francisco,

and Strait of Juan de Fuca.—See routes in Chapter 3.

Honolulu to Seward.—Rhumb lines through 21°19′ N., 157°36′ W., and 59°30′ N., 149°30′ W.

Pilotage.—This is compulsory for all foreign vessels and for United States vessels under register in the foreign trade; it is optional for United States vessels in the coastwise trade. State pilots of the Harbors Division, Hawaii Department of Transportation, are available at all deepwater ports.

Towage.—Tugboats are available at the deepwater ports. Honolulu has some salvage equipment.

Customs.—Honolulu is the headquarters of a customs district and is a customs port of entry at which marine documents are issued. The other deepwater harbors also are ports of entry.

Quarantine.—Principal officials are stationed at Honolulu. Vessels entering the deepwater ports usually are boarded at the piers. The U.S. Public Health Service has outpatient offices in Honolulu, Hilo, Kahului, and Lihue. There are good hospitals on Hawaii, Maui, Lanai, Oahu, and Kauai.

Immigration.—Honolulu is a district headquarters of Immigration Service. Ships agents should make the necessary advance arrangements for officials to board vessels at other deepwater ports.

Harbor regulations.—These are established by the Harbors Division, Hawaii Department of Transportation, which also assigns harbormasters to the deepwater ports and the commercial barge harbors.

Supplies.—Honolulu is the principal supply center for the State. Fresh water is piped to most of the wharves in the deepwater ports. Gasoline, diesel fuel, ice, and minor items of ship chandlery are available at the smaller ports.

Repairs.—Honolulu has a floating drydock that can handle medium-size cargo vessels. The other ports have only minor facilities for small vessels.

Communications.—Honolulu is a major port of call for transpacific passenger and cargo vessels; air service, passenger and freight, includes scheduled flights to the other islands, to the mainland, and to western and southwestern Pacific areas. The other deepwater ports have regular interisland barge service and are irregular ports of call for transpacific vessels, but interisland passenger travel is almost entirely by air.

Standard time.—The standard time used in most of Hawaii is 10 hours slow of Greenwich mean time. Example: When it is noon at Greenwich it is 2 a.m. at Honolulu.

HAWAII ISLAND (Chart 4115), at the southeast end of the archipelago, is the **"Big Island"**; its area of 4,021 square statute miles is twice that of all the other islands in Hawaii State combined. The island is roughly triangular in shape, 82 nautical miles north to south and 72 miles east to west.

Hawaii is also the **Volcano Island**; it has five volcanoes, two of which—Mauna Loa and Kilauea—are still active. **Mauna Kea** and **Mauna Loa,** the two mountains that dominate the island, rise to heights of nearly 14,000 feet and are the highest in the State; from their summits the land descends gradually with occasional cinder cones and lesser peaks dotting the slopes. Lava flows are numerous and some reach the coast. **Kilauea,** 20 miles eastward of Mauna Loa and 9 miles from the southeast coast, appears to be a crater in the side of its towering neighbor but is really a separate peak with an elevation of more than 4,000 feet.

Mount Hualailai, a peak with an extinct crater, rises to an elevation of 8,269 feet near the middle of the western coast. **Mount Kohala,** 5,505 feet high, rises from the **Kohala Peninsula** at the northwestern end of the island.

A highway encircles the island and another leads from Hilo to Waimea by way of the pass between Mauna Kea and Mauna Loa.

Anchorages.—There is little shelter from the northeast trades along the northeast and southeast sides of the island. Good anchorage is available along much of the west coast but there are some areas so steep-to that anchorage is not practicable.

Currents.—The currents generally follow the northeast trade wind but occasionally set against it. One current follows the coast northwestward from Cape Kumukahi, the eastern extremity of Hawaii, and around Upolu Point, the northern extremity. Another current follows the coast southwestward from Cape Kumukahi around Ka Lae, the southern extremity, and thence northward to Upolu Point; the latter flow is accompanied by an inshore counter current which sets southeastward from Hanamalo Point around Ka Lae and thence northeastward to Keauhou Point. An inshore current sets northward from Hanamalo Point and sometimes attains considerable velocity. There are reports of strong northeastward currents off Makolea Point and strong northward currents at Mahukona; another report states that currents offshore from Makolea Point set eastward toward the coast. Currents are weak at Kawaihae; southwestward currents with velocities of 0.5 knot have been observed in Honokaope and Kiholo Bays.

Weather.—The northeast trade winds seem to divide at Cape Kumukahi, one part following the coast northwestward and losing its force when it rounds Upolu Point, the other part following the coast southwestward and around Ka Lae. On the west coast of Hawaii, except at Mahukona, the sea breeze sets in about 9 a.m. and continues until displaced by the land breeze that usually springs up after sundown. Vessels bound eastward to ports on the windward side of the island should pass Upolu Point close-to and avoid the heavier offshore winds.

During the trades, the northeast coast frequently is clouded over in early morning but there is clear weather one or two miles offshore; when the breeze picks up about 9 a.m. the clouds are driven inland. Rainfall varies greatly with locality; the greatest amount is along the

windward side, the Kona highlands get a moderate amount, and a little reaches the Kau District and the west coast.

The northeast coast of Hawaii Island has a length of about 77 miles between Upolu Point, the northern extremity, and Cape Kumukahi, the eastern extremity. This coast is mostly bold and all dangers can be avoided by giving it a berth of 2 miles. Hilo Bay is the only sheltered harbor or anchorage.

Chart 4140.—The numerous bluffs in the vicinity of **Upolu Point** appear quite similar from seaward. The buildings and radio poles of a commercial airport are prominent on the western part of the point; an aviation light is atop the station building. The Loran tower 2.3 miles southwestward of Upolu Point is marked by lights. See Appendix for **storm warning displays.** The country back of the point is planted in sugarcane; the camps and villages are generally situated high on the bluffs and among the occasional clumps of trees.

Kauhola Point Light (20°15.0′ N., 155°46.5′ W.), 115 feet above the water, is shown from an 85-foot white cylindrical concrete tower on the low point 5 miles eastward of Upolu Point. A dangerous reef, usually marked by breakers, extends 0.3 mile from Kauhola Point; passing vessels should give the point a berth of 2 miles.

Local vessels sometimes anchor in **Keawaeli Bay**, on the west side of Kauhola Point, in depths of 9 fathoms with the light 0.3 mile distant on bearing 090°. Protection is afforded vessels forced to leave anchorage on the west coast during strong kona storms. **Halaula** (P.O.), the principal village of the vicinity, is a mile from the light; a stack is prominent.

Akokoa Point, 2.8 miles southeastward of Kauhola Point, is the easterly limit of the Kohala District sugar plantations. The country southeastward of Akokoa Point rises gradually to the **Kohala Mountains,** which are heavily wooded to their summits.

Chart 4115.—The 10-mile stretch of coast between Akokoa Point and Waipio Gulch is backed by cliffs ranging up to 1,300 feet in height and deep gorges that extend well inland. Waterfalls are numerous. The cliff faces have a general brownish appearance, but in some places they are covered with vegetation from top to bottom.

Honokaneiki Gulch, 9.2 miles southeast of Upolu Point, opens into a narrow bay which affords fair protection and possible landing places for small boats. A rock awash, 0.5 mile offshore from the gulch, is surrounded by depths of 12 to 14 fathoms.

Two rocky islets, the larger 230 feet high, are about 300 yards offshore 0.8 mile southeast of Honokaneiki Gulch. Between Akokoa Point and the islets the bottom is fairly regular and slopes gradually to the 20-fathom depth curve, which is about 0.7 mile offshore.

Waimanu Valley, 14.5 miles southeast of Upolu Point, splits the highest cliffs in the vicinity and is the second largest ravine along this coast. Waimanu Bay may be used as an anchorage in favorable weather; there are depths of 7 fathoms 0.2 mile offshore from the ravine.

Waipio Gulch, the largest ravine along this coast, is 3 miles southeast of Waimanu Valley. The gulch is a remarkable cleft in the bluffs and is easily recognized. Taro is grown in the vicinity of **Waipio,** a small village near the mouth of the gulch. In favorable weather, anchorage may be found in depths of 7 to 9 fathoms 0.3 mile off the gulch or under the bluffs to the eastward.

From Waipio Gulch eastward the cliffs become lower, and at Kukuihaele the coast is a comparatively low bluff 30 to 300 feet high. The slopes between Waipio Gulch and Hilo are planted in sugarcane to an elevation of about 2,000 feet; continuing upward toward Mauna Kea, the slopes are wooded to about 2,600 feet, then present a barren appearance. Mauna Kea is frequently snowcapped during the winter months.

Chart 4162. — Kukuihaele Light (20°07.9′ N., 155°33.5′ W.), 154 feet above the water, is shown from a 34-foot white pyramidal concrete tower at **Kukuihaele** (1960 pop. 424; P.O.), 19 miles southeast of Upolu Point.

Honokaa (1960 pop. 1,247; P.O.), 24 miles southeast of Upolu Point, is marked by three storage tanks on a low bluff. Close to southeastward of the landing is a high trestle over a gulch. The lone stack of a mill 1 mile southward of the landing can be seen among a large clump of trees. A reef that usually breaks extends 170 yards northward from the landing and is marked by several bare rocks. No shelter is available during normal weather, as the landing is open to the north and east. An occasional ship uses the landing to discharge oil or load molasses.

Chart 4161.—Paauhau (P.O.), 26 miles southeast of Upolu Point, is marked by the masonry of the abandoned inclined railway that leads to the top of the bluff. A mill with a tall stack is on the bluff 700 yards southeast of the landing. The deep gulches on either side of the mill are spanned by trestles. The shore at the foot of the bluff consists of rocks and ledges over which the sea breaks constantly. The small concrete landing at the foot of the masonry incline offers little protection from the northeast trades.

Chart 4115.—Paauilo (1960 pop. 1,059; P.O.) is 31 miles southeast of Upolu Point and a mile inland. A mill stack is near the top of the bluff on the seaward side of the town.

Ookala (1960 pop. 562; P.O.), about 36 miles southeast of Upolu Point, is on the edge of a bluff on the south side of a deep gulch. A mill stack can be seen from seaward but most of the buildings are hidden by the trees.

Kaawalii Gulch is about 1.5 miles southeast of Ookala. A pumping-station stack is close to the beach. In this locality the country back of the coast changes slightly in appearance; hummocky fields are noticeable.

Laupahoehoe Point, 39 miles southeast of Upolu Point, is low and flat and makes out about 0.3 mile from a deep gulch. **Laupahoehoe Point Light (19°59.8′ N., 155°14.6′**

W.), 55 feet above the water, is shown from a 36-foot white skeleton tower on the point. The outer end of the point is a mass of black lava rock which is broken into detached ledges that extend 250 yards seaward from the light. The seas usually break with considerable force over the ledges.

Laupahoehoe (1960 pop. 407; P.O.) is at the inner end of the point. The boat landing, which is little used, is in a 30-foot opening in the rock on the southeast side of the point. The landing affords some protection for small boats but its use is not recommended when considerable swell is running.

Papaaloa (1960 pop. 449; P.O.), 1.5 miles southeast of Laupahoehoe, can be identified by a waterfall directly under a mill and stack on the edge of the bluff. A horizontal string of bright lights makes a good mark at night.

Maulua Bay, 1.7 miles southeast of Papaaloa, is a 0.3-mile indentation in the coast at the mouth of a gulch which is spanned by a high bridge. In favorable weather, small boats could be beached on the shingle at the head of the bay. Only slight protection is afforded from the northeast trades. **Ninole** (P.O.) is 1.5 miles southeast of the bay.

Honohina, 6.5 miles southeast of Laupahoehoe Point, is a settlement on the plain between two gulches. No stacks or prominent buildings are to be seen from seaward. The land has lost its hummocky appearance and the cane-covered fields are more uniform, although still broken by gulches. Between Honohina and Hilo the bluffs gradually decrease in height and finally disappear.

Hakalau Bay, 8.5 miles southeast of Laupahoehoe Point, lies at the mouth of **Hakalau Gulch.** Prominent from offshore are a high trestle spanning the gulch, a mill and buildings lying in the gulch at the base of the south bank, and several buildings on the highland just south of the gulch and quite close to the edge of the bluff. At night a row of prominent lights extends from the highland down to the gulch.

Wailea is a small settlement a mile southward of Hakalau Bay and just north of **Kolekole Gulch.**

Honomu (1960 pop. 663; P.O.) is at the mouth of a gulch 10.5 miles southeast of Laupahoehoe Point.

Pepeekeo Point, 52 miles southeast of Upolu Point and 25 miles northwest of Cape Kumukahi, is the most prominent point in the vicinity. **Pepeekeo Point Light (19°51.0′ N., 155°05.1′ W.)**, 147 feet above the water, is shown from a 75-foot white pyramidal skeleton tower on the north side of the entrance to Hilo Bay. The cane-covered cinder cones 2 miles inland from the light are fairly prominent. **Papaikou** (1960 pop. 1,591; P.O.), 4 miles south of Pepeekeo Point, is on the west side of Hilo Bay.

Chart 4103.—Hilo Bay has an entrance width of 8 miles between Pepeekeo Point on the north and Leleiwi Point on the southeast; the head of the bay is 4 miles inland. **Hilo** (1960 pop. 25,966; P.O.), on the southwest side of the bay, is second in importance of the commercial deep-water harbors in Hawaii State.

The westerly shore of Hilo Bay is bluff, but the southerly and southeasterly shores are low. The outer bay is exposed to the northeast trades, but the inner harbor is protected by a breakwater on Blonde Reef. There is frequently a heavy swell which is deflected eastward by the western shore and causes considerable surge at the wharves behind the breakwater.

Prominent features.—Paukaa Point Light (19°45.9′ N., 155°05.5′ W.), 145 feet above the water, is shown from a white pyramidal skeleton tower about 2 miles north of Hilo. The sugar mill at **Alealea Point,** on the north side of the city, has a large stack, and just south of the mill is a high stone abutment; when the mill is operating at night it can be recognized by its lights.

The marine terminals are in **Kuhio Bay,** behind the inner end of the breakwater. South of the terminals is a large commercial airport; the aviation light at the airport can be seen many miles at sea.

Channels.—From deep water on the north, the channel to the inner harbor leads between the breakwater and the western shore, then turns sharply eastward and follows the south edge of Blonde Reef to the wharves in Kuhio Bay. A Federal project provides for an entrance channel 35 feet deep and a harbor basin of same depth in Kuhio Bay. Channel and basin are maintained at or near project depth; markers include lighted and unlighted buoys and a **098° lighted range.**

Anchorages.—Anchorage may be obtained anywhere under the lee of the breakwater where depths are suitable. Good anchorage is available west of Kaulainaiwi Island in depths of 4 to 6 fathoms over good holding ground. The Hilo harbormaster usually assigns deep-draft anchorages.

Dangers.—Blonde Reef has depths of 1 to 4 fathoms and extends 1.5 miles in a northwesterly direction from the southeast side of Hilo Bay. In general, the shoaling is abrupt on all sides of the reef. A lighted buoy is off the outer end of the breakwater which extends the length of the reef.

Opposite Blonde Reef are two small islands on a reef that makes out 0.3 mile from the southern shore; bare **Kaulainaiwi Island** is near the outer end of the reef and wooded **Cocoanut Island** is close to shore. A lighted buoy marks the outer end of the reef.

A large fleet of fishing boats operates in the outer part of Hilo Bay; the movements of these boats are uncertain, and approaching vessels should maintain a sharp lookout. The approach should be made from northward, favoring the western shore and avoiding the northwestern part of Blonde Reef; vessels have gone aground on the north side of the breakwater.

Tides.—The diurnal range of tide is 2.4 feet at Hilo.

Currents.—A north-northwestward current of about 1 knot has been reported in the approach to the harbor. After heavy rains, currents from **Wailoa River** and **Wailuku River** set northward in the inner harbor.

Weather.—The prevailing winds are the northeast trades. At night and early morning a gentle breeze generally comes off the land. Annual rainfall averages 140 inches. See Appendix for **Hilo climatological table** and **storm warning displays.**

Pilotage.—This is compulsory for all foreign vessels and for United States vessels under register in the foreign trade; it is optional for United States vessels in the coastwide trade. Pilots will board, day or night, a mile off the entrance if given suitable advance notice of arrival.

Towage.—Reported facilities include a 65-foot, 240-horsepower diesel tug, equipped with radiotelephone, and a 46-foot diesel launch.

Quarantine.—Officials are stationed in Hilo. The U.S. Public Health Service maintains an outpatient office in the port.

Customs.—Hilo is a customs port of entry; customs officials are stationed in the city.

Immigration.—This is handled by officials stationed in Honolulu.

Harbor regulations.—These are established by the Harbors Division of the Hawaii Department of Transportation. The harbormaster enforces the regulations and assigns anchorages.

Wharves.—Two State-owned piers provide cargo sheds and 2,500 feet of berthing space. State-owned pipelines are available for petroleum products, liquid fertilizer, and molasses. Private facilities include heavy-lift cranes and storage space for sugar, molasses, petroleum products, and liquid fertilizer.

Hilo Bay is subject to heavy surge, particularly between October 1 and April 15. Large vessels make fast to mooring buoys when coming alongside Pier No. 1; this is necessary to assist in leaving the pier and for breasting off when the surge is excessive. The use of wire mooring lines is not advised; vessels should be equipped with a full set of 8-inch manila lines: four bow lines, four stern lines, double springs, and two 800-foot breast lines with 4-fathom lashings of 3½-inch manila.

Most of the small fishing craft of the area tie up to the moorings in the mouth of Wailoa River; a light, a daybeacon, and a buoy mark the entrance. Clearance is limited under the highway bridge at the entrance, and the channel is not well defined.

Supplies.—Fuel and water are available on the State piers. Ice, provisions, lumber, and some ship chandlery may be obtained in Hilo.

Repairs.—A marine railway at Hilo has a capacity of 50 tons. The local machine shops are equipped to make extensive repairs.

Communications.—Hilo has regular interisland barge service and is a port of call for transpacific vessels, but interisland passenger travel is almost entirely by air. Radiotelephone communication is available to the other islands and to the mainland.

Chart 4115—Leleiwi Point, on the southeast side of the entrance to Hilo Bay, is marked by a mass of bare, black lava rock about 20 feet high that extends 100 yards seaward from the tree line; the low point is difficult to identify at night.

The 17-mile stretch of coast between Leleiwi Point and Cape Kumakahi is a series of low bluffs. **Olaa** (P.O.), 6 miles south of Leleiwi Point and 3 miles inland, is marked by a tall mill stack: the Olaa plantations rise to an elevation of about 2,000 feet, above which the forests may be seen. An old lava flow reaches the sea 4 miles northwest of Cape Kumukahi and is marked by two black hills, about 50 feet high, lying close together at its seaward end.

Cape Kumukahi Light (19°31.2′ N., 154°48.8′ W.), 165 feet above the water, is shown from a 124-foot white square, pyramidal skeleton tower on the eastern extremity of Hawaii Island. The cape is a low mass of bare, black lava with a jagged top and is clearly defined from all sides; sharp pinnacles mark the end of the point. A chain of old craters, or cinder cones, extends 7 miles southwestward from the cape; the nearest cone, 1.4 miles from the cape, is 245 feet high and is topped with scattered coconut palms.

The southeast coast of Hawaii Island has a length of 63 miles between Cape Kumukahi, the eastern extremity, and Ka Lae, the southern extremity. This coast is mostly bold but passing vessels are advised to keep at least 1 mile offshore. There are no all-weather harbors or anchorages.

The country southwestward of Cape Kumukahi is heavily wooded and there are numerous coconut groves along the beach. Characteristic of this coast are the lava flows, bare and rough in appearance, which extend from the hills to the sea. The old craters southwestward from the cape join the ridge which forms the divide between the **Puna** and **Kau Districts.**

Puu Honuaula, 5 miles southwestward of Cape Kumukahi and 3 miles inland, is 844 feet high and quite prominent. The southeast side is blown out, but the remaining slopes are cane-covered and the rim is fringed with trees.

Opihikao, a village 7 miles southwest of Cape Kumukahi, is marked by a prominent grass-covered mound, 125 feet high, near its northeast beach.

Kaimu, a village 13 miles southwest of Cape Kumukahi, has a black sand beach that may be used as a boat landing; the beach is steep and free from rocks.

Kalapana, a village 14 miles southwest of Cape Kumukahi, is on the low ground north of **Hakuma Point,** a black flat-topped headland 65 feet high, which is the most prominent in the vicinity and obscures the village from the southwest.

Kupapau Point is prominent 17 miles southwest of Cape Kumukahi. **Apua Point,** 27 miles southwest of the cape, is low and bare; shallow water extends 300 yards or more offshore. **Keauhou Point,** 2 miles west of Apua Point, is another prominent feature.

Between Kupapau Point and Keauhou Point, the coastal plain and the lower slopes of the mountains are devoid of vegetation; higher up the mountains are wooded. Beginning 2 miles west of Kupapau Point is a series of bluffs several hundred feet high and 1 to 3 miles back of the shore. The bluffs are marked by numerous lava flows. The volcano of **Kilauea** cannot be seen from seaward, but its location, when active, is indicated in daytime by the smoke that it discharges and at night by the glare on the clouds.

At Keauhou Point the bluffs are yellow, steeper, and near the beach. The plain at the foot of the bluffs is low,

and on a dark night the beach is hard to see. About 2 miles westward of Keauhou Point is a yellow bluff which is about 300 fet high at its northeasterly end. This bluff is the most prominent landmark near the beach on this part of the coast.

About 1.5 miles west of Keauhou Point is **Keaoi Island,** which is low, close inshore, and separated from the mainland at its easterly extremity only by shoal water. Small boats find shelter behind this islet by entering from the west.

Kau Desert, the country southward of Kilauea volcano, is devoid of vegetation. The **Great Crack,** on the western side of the 1823 lava flow from Mauna Loa, marks the western limits of the desert. The Great Crack, which is visible from seaward, passes along the eastern side of **Puu Ulaula.** The hill is 1.5 miles inland and 994 feet high. A sharply defined, low, black cone is about 5 miles inland and on the easterly side of the lava flow at an elevation of about 1,800 feet.

Pahala (1960 pop. 1,392; P.O.), 3 miles inland, is 42 miles southwest of Cape Kumukahi and 21 miles northeast of Ka Lae. A tall mill stack is prominent.

The country between the Great Crack and Punaluu is covered with sugarcane to an elevation of about 2,000 feet; thence the slopes are wooded to within about 6,000 feet of the summit of Mauna Loa. Here and there bare lava flows cut up the canefields. Cane in the Kau District extends as far west as Waiohinu.

Chart 4162.—Punaluu, 17 miles northeastward from Ka Lae, was formerly the shipping point for Pahala but the landing is no longer used. Small boats find some protection in depths of 6 to 11 feet close to the eastern shore of the small bight which forms **Punaluu Harbor.** The landing at the head of the bight is marked by the ruins of a warehouse. A prominent church with a steeple is 0.3 mile southwest of the landing.

The southwestern part of the bight is foul. A rock, awash at half tide, is 260 yards south-southeast of the landing; another, with 8 feet of water over it, is 40 yards farther offshore in the same direction. The entrance is between these rocks and the shore to the northward. A rock, with 3 feet of water over it, is 0.2 mile east of the entrance and 80 yards offshore. The northeast trades tend to haul more offshore in the vicinity of Punaluu Harbor, but in rough weather breakers extend completely across the entrance and passage is impossible.

Chart 4115.—The church and houses of **Hilea,** 1.7 miles west of Punaluu and 1.5 miles inland, can be seen from seaward. Back of the landing at Punaluu, and up to an elevation of about 3,500 feet, the slopes are broken; above this they appear regular and gradual to the summit of Mauna Loa. The upper slopes of Mauna Loa can only be seen from several miles offshore.

Puu Enuhe, 3 miles northwestward of Punaluu, is the seaward end of **Enuhe Ridge.** The butte is a conspicuous flat-topped cone with an elevation of 2,327 feet. **Kaiholena, Pakua,** and **Makanau Buttes** are promontories on **Kaiholena Ridge,** which extends 3 miles northwestward from the village of Hilea. **Ninole Gulch** lies between the two ridges, making the region extremely rugged, with the buttes standing out boldly. The buttes are prominent from either the southwestward or northeastward.

Kaumaikeohu Peak, about 5 miles northward of Punaluu, is a prominent cone, 3,430 feet high, on the southeast boundary of the Kau Forest Reserve.

Between Punaluu Harbor and Honuapo Bay the shore is composed of masses of black lava rock which project out into deep water. About 1 and 3 miles southwestward of Punaluu are two conspicuous lava flows which reach the shore. Some of the slopes back of Honuapo Bay are covered with cane.

Chart 4162.—Honuapo Bay is a slight coastal indentation 13 miles northeast of Ka Lae. Most prominent from offshore is the 236-foot cliff 0.5 mile southwest of the bay; the upper half of the cliff shows black against the light-brown background of the hills, and the lower half is a grass-covered slide. Also prominent is a mill stack 0.4 mile north of the bay. The Honuapo pier is in ruins.

Chart 4115.—Naalehu (1960 pop. 952; P.O.), 11 miles northeast of Ka Lae and 2 miles inland, is on the southern side of the base of **Puu Hoomaha,** which is 2,109 feet high. The country between Naalehu and Ka Lae is a grassy plain on which cattle range.

Maniania Pali begins at **Kimo Point,** 11 miles northeast of Ka Lae, and ends at **Waikapuna Bay,** 9 miles from Ka Lae; the black coastal cliff is 100 to 200 feet high and has a band of yellow clay on top. From Waikapuna Bay to Kamilo Point the coast is low and rocky.

Kamilo Point, 6 miles northeast of Ka Lae, is a low, dark, lava mass on which is a black lava monument with a square base surmounted by a dome. A reef over which the sea generally breaks extends about 0.3 mile from the point.

Kaalualu Bay, 1 mile westward of Kamilo Point, affords good shelter for small craft during northeast trades, but is exposed during kona weather. Anchorage can be found in depths of about 10 fathoms 200 yards due west of the point on the east side of the entrance. The submerged coral reefs between the anchorage and the northeast part of the bay should be avoided, especially during periods of heavy swells.

Between Kaalualu Bay and Ka Lae, the grassy plain is occasionally broken by bare lava. About 2.5 miles southwestward of Kaalualu Bay, the low coastline is broken by a grayish cinder cone.

Ka Lae (South Cape) is the southern extremity of Hawaii Island. **Ka Lae Light (18°54.9′ N., 155°41.1′ W.),** 73 feet above the water, is shown from a 45-foot white pyramidal skeleton tower on the outer end of the cape. The southeasterly side of the point is low; the bluff on the westerly side rises gently from the point to a height of 335 feet 2 miles to the northward. The bluff then leaves the shore and trends inland for several miles, increasing in height and forming the **Pali o Mamalu,** a remarkable cliff when seen from the westward. Shoal water

extends 0.6 mile south of the point; all vessels should keep 1 mile off to avoid possible dangers. The shore current setting northeastward against the trade wind frequently produces a rough sea on the eastern side of the cape. Offshore the current sets southwestward.

From Ka Lae to Upolu Point, a distance of about 95 miles, the coast has a general northerly trend and is mostly bold. The largest reef extends about 0.6 mile from shore in Kawaihae Bay; few of the others off the numerous capes and points make out more than 0.3 mile. All dangers can be avoided by staying at least 1 mile offshore.

No harbor or anchorage along the west coast affords shelter during all winds; all are smooth during the regular northeast trades but exposed during kona weather. The trade winds draw around Ka Lae and hold northward offshore for about 3 miles, generally causing a rough sea. Close inshore the sea is generally smooth.

Storms from the southwest to northwest are most frequent in January and February. Some protection for small craft may be found in Keauhou and Kawaihae Bays but anchorage space is limited. Boats sometimes seek shelter along the southeast side of the island during these storms.

Gasoline and a limited supply of water are available at most of the small harbors along the west coast. Supplies are mostly obtained from the stores on the main highway inland from the coast.

The section of the west coast between Ka Lae and Kawaihae Bay, 79 miles northward, is known as the **Kona Coast.** The country along this coast is broken up by numerous lava flows, varying in length from a few hundred yards to 30 miles, that have broken out from Mauna Loa and Mount Hualailai. Between these flows are areas that are heavily wooded and covered with vegetation above an elevation of 1,500 feet, and there are large areas planted in coffee. Many of the lava flows reach the coast and terminate in bluffs, some fairly high and others only a few feet above the water. Scattered trees and bushes can be seen between many of the flows.

From Pali o Mamalu to Hanamalo Point, about 16 miles northwestward, are lowlands several miles wide, which rise gradually to the mountains. The country is extremely desolate, with its grayish-black slopes of bare lava. A particularly black flow lies at the base of the lighter-colored cliffs of Pali o Mamalu.

At an elevation of 2,000 feet the kona region is known for its cool and bracing climate and plentiful rain. Little variation in weather conditions is experienced, there being generally a land and sea breeze, except during kona winds. This condition, however, does not apply between Kawaihae Bay and Upolu Point, since the region is affected by the winds which draw across the island.

Waiahukini, a small fishing village at the base of Pali o Mamalu, is marked by a patch of white sand. **Kailikii Shoal** extends about 0.5 mile offshore to the west and north of the landing.

Puu Hou, a black, well-defined cone 273 feet high, is close to the beach 1.6 miles northwestward of Waiahukini.

Pohue Bay, 9 miles northwestward of Ka Lae, has a sand beach at its head where landings can be made.

Na Puu a Pele are cones near the beach 12 miles northwestward of Ka Lae. The cones are prominent landmarks, and at the summit of the highest is a black stone cairn.

Kauna Point, 13.5 miles northwestward of Ka Lae, is low, flat, and somewhat grassy, with a small hummock of grayish lava 0.5 mile inland. A light, 52 feet above the water, is shown from a white skeleton tower on the point.

Kanewaa Point is 18.5 miles northwest of Ka Lae. The **danger zone** of a practice aerial target is centered on the point; **see 204.225, Chapter 2, for limits and regulations.**

Okoe is at the head of **Okoe Bay,** a cove immediately south of Hanamalo Point. The cove indents the shore more than any other in the vicinity and has a little more sand on the beach. Anchorage can be found in depths of 7 to 15 fathoms.

Hanamalo Point, 21 miles northwestward of Ka Lae, is a low mass of lava with no prominent features. Unless close inshore, the point is difficult to distinguish from other points in the vicinity. South of Hanamalo Point an inshore current sets southward around Ka Lae and thence northeastward along the shore to the vicinity of Keauhou Point.

Milolii, a village 2 miles northward of Hanamalo Point, has a concrete boat landing with derrick and shed. The landing has a depth of 7 feet alongside. The current off the landing has a prevailing northerly set which sometimes reaches a velocity of 2 knots. A reef extends about 400 yards outward from the point of land on which the schoolhouse is located.

The schoolhouse, visible only from northwestward, is in the ironwood grove 250 yards southward of the Milolii landing. Between the school and the landing is a grove of coconut trees, back of which are the 15 or 20 houses of the village. Otherwise, the countryside is a barren mass of lava. There is no protected anchorage off the landing. Small craft anchor to permanent moorings in depths of about 15 fathoms to which they can tie up during most of the year. Storms occur most frequently in January and February.

The lava flow of 1926 from the slopes of **Puu o Keokeo** entirely destroyed the village of **Hoopuloa,** 1 mile northward of Milolii. The same flow nearly engulfed Milolii. About 3 miles north of Milolii the black flow of 1919 is prominent.

Lepeamoa Rock, 11 miles northward of Hanamalo Point, is close offshore from the island. The rock, which is about 100 feet high, is the crescent-shaped rim of an old crater that has had its seaward face blown out. About 1.5 miles inland from the rock is the 1,766-foot peak of **Haleili.** Small villages of a few houses each are scattered along the coast, 1 or 2 miles apart, between Milolii and Lepeamoa Rock. The highway, which is 2 miles inland at Milolli, draws nearer the coast until at Lepeamoa Rock it is only 0.5 mile inland.

Kauhako Bay, 34 miles northwestward of Ka Lae, is a small cove which has at its head a pali, or cliff, about

0.5 mile long and 120 feet high. **Hookena** is a small village at the foot of the northerly end of the pali. A prominent landmark is a stone church, with steeple, at the northerly end of the village. A large grove of coconut and shade trees is near the village. Anchorage can be found in depths of 15 fathoms, sandy bottom, about 300 yards off Hookena. There is a landing near the north end of the sand beach.

The bluffs along the coast north of Hookena lose their height. The slope up to the interior is not so steep as to the southward, and the country is covered with brush and coffee plantations.

Loa Point, about 35.5 miles northwestward of Ka Lae, is flat and low, and green to within 40 yards of the water, then rocky.

Between Loa Point and Hookena is the settlement of **Kealia,** which is at the north end of a long pebble beach. The villages along this section of the coast usually have a few houses on the beach, but most of the houses are on the highway 1 or 2 miles inland.

Chart 4123.—Honaunau Bay, 37 miles northwestward of Ka Lae, indents the coast about 500 yards and is about 500 yards in width. The bay lies between two flat lava points. **Puuhonua Point,** on the south, is lower and smaller and is marked by the 12-foot-high stone walls of the **City of Refuge** and by a grove of tall coconut trees. The City of Refuge is of historic interest and is now maintained as a county park. In former times criminals or refugees reaching the place were safe until such a time as the king of the land took action. Sampans anchor in depths of 4 to 8 fathoms 150 yards from the south shore. Ship's boats can easily land on the shingle beach on the southeastern side of the bay during normal weather.

Palemano Point, on the south side of the entrance to Kealakekua Bay, is low and flat, with scattered coconut trees and temple ruins near its outer end. The buildings of a resort camp on the point are prominent. A mass of bare rocks extends 125 yards off the north side of the point. About 0.4 mile northward of the point an old lava flow reaches the shore.

Kealakekua Bay, 40 miles northwestward of Ka Lae, is marked on its northerly side by a light on Cook Point. The bay is about 2 miles wide between Palemano Point and Keawekaheka Point, and indents the coast about 1 mile. The shore is low, except on the northeast side where a precipitous cliff between 400 and 600 feet high extends about 0.5 mile. A narrow reef fringes the shore between the southerly end of the cliff and Palemano Point. The bay is free of obstructions, affords good anchorage in all but strong southwesterly winds, and is by far the best anchorage along this coast. In choosing an anchorage it is well to remember that in the daytime a sea breeze will prevail, shifting to a land breeze at night. The bottom is of coral and sand and is only fair holding ground.

Kaawaloa Cove is the northerly part of Kealakekua Bay and lies between the high cliff and Cook Point. It was here that Captain James Cook was killed by the natives in 1779. **Cooks Monument** is a concrete shaft, 25 feet high, near the shore of the inner side of Cook Point. A concrete landing with a depth of about 6 feet alongside affords a means for visitors to reach the monument.

The village of **Napoopoo** consists of a few houses scattered among the coconut trees just southward of the cliff. Provisions can be obtained in limited quantities; fresh water is scarce. Gasoline and some ship chandlery may be obtained. The landing, which has a depth of about 4 feet alongside, is in the middle of the village. During a heavy swell it is best to land on the sand beach at the north end of the village. A church spire is fairly prominent from offshore.

Keawekaheka Point, on the north side of the entrance to Kealakekua Bay, is a low bare, lava point. An extensive lava flow reaches from the point to the high cliff at the head of the bay.

Chart 4140.—Puu Ohau, 1.5 miles north of Keawekaheka Point, is a green cone, 231 feet high, near the beach. The cone has a blowhole in the middle and its seaward side is blown out, forming a red cliff.

Keikiwaha Point, 2 miles northward of Keawekaheka Point, is low, black, and jagged, with coconut trees on it. About 2 miles inland from the point, and on the highway, are a stack, a church, and the buildings of **Kainaliu.**

From Napoopoo to Kailua is the most thickly settled section of the coast, and cultivated fields of coffee extend both ways from the highway which parallels the shore 1 to 2 miles inland.

Chart 4163.—Keauhou Bay, 45 miles northwestward of Ka Lae, indents the coast 0.3 mile and is 300 yards wide between entrance points. The bay lies between two lava flows at the foot of a gentle slope and, though small, is one of the best protected along the kona coast. An **entrance light,** 25 feet above the water, is on the shore at the head of the bay. The **Keauhou** schoolhouse on the highway 1.5 miles inland is fairly prominent from offshore. The bottom is extremely irregular and has many coral heads with depths of 5 to 6 feet over them. A reef extends 100 yards off the north entrance point, and boats should favor the southerly point when entering. By maintaining a lookout for coral heads, boats of 4-foot draft can enter the bay for anchorage. Breakers frequently extend across the mouth of the bay. Fuel and a limited amount of water are available. A marine railway is capable of hauling out vessels up to 45 feet in length.

Chart 4140.—Kahaluu is a small village about 1 mile northward of Keauhou.

Mount Hualailai, in the central western part of the island, is a conical peak 8,269 feet high, covered with vegetation to its summit and prominent from any point of approach. Its western slopes terminate in a bare, lava plain about 4 miles wide. The plain forms a low beach consisting of sand in some places and lava rocks in others.

Chart 4164.—Kailua Bay, 50 miles northwestward of Ka Lae, is a dent in the coast at the southerly end of the flat plain which extends northward to Kawaihae Bay.

Kailua (1960 pop. 466; P.O.) is a commercial barge harbor on the north side of the bay.

Kailua Light (19°38.5′ N., 156°00.2′ W.), 32 feet above the water, is shown from a white pyramidal concrete tower on **Kukailimoku Point,** which is on the northwest side of the bay entrance; an aero light is about 0.6 mile northwest of the surface light. Also prominent are the transit shed on the Kailua pier, the oil tanks west of the pier, the church spire east of the pier, and the Kona Inn, a long building south of the church.

No breakwater protects this small exposed harbor. Access is good and no channel is required to reach open water. The turning basin is 12 to 20 feet deep and about 500 feet square. The State-owned pier provides a cargo shed and about 350 feet of berthing space. A State-owned pipeline is available for petroleum products, and private facilities include bulk-handling and storage for petroleum products. Gasoline, fresh water, groceries, and marine hardware are available in limited quantities. See Appendix for **storm warning displays.**

Chart 4140.—The coast between Kailua Bay and Kawaihae Bay is a black, jagged mass of lava. The numerous capes and indentations are caused by the lava flows over the level country. Between Keahole and Upolu Points, the trade winds draw over the mountains, at times causing a very strong offshore wind. Vessels anchoring in this vicinity should be prepared to use both anchors, as the prevailing northerly current prevents laying to the wind.

Kaiwi Point, about 2 miles northwestward of Kailua, is low and black, with some small patches of white sand. Shoal water extends about 0.3 mile offshore on the south side of the point, but on the west side the 100-fathom curve is only 0.3 mile offshore.

Keahole Point, 57 miles northwestward of Ka Lae, is the western extremity of Hawaii Island. **Keahole Point Light (19°43.9′ N., 156°03.8′ W.),** 43 feet above the water, is shown from a 33-foot white pyramidal concrete tower. The point is low and well defined, and consists of black lava with some small vegetation. White patches of sand may be seen between the fingers of the lava. A northward current sets past Keahole Point. Frequently there are small tide rips near the point, and 2 miles to the northward the rips are violent when the northeast trade winds are strong. A berth of 0.5 mile clears the point in deep water.

Puu Waawaa, 13 miles eastward of Keahole Point, is prominent and can often be seen when Mount Hualailai is hidden by the clouds. The mountain, 3,971 feet high, is dome-shaped, with deep gorges on its side, and rises about 1,000 feet above the slope on which it stands.

Between **Makolea** and **Kawili Points,** 3 and 4 miles northward of Keahole Point, shoal water extends about 0.7 mile offshore. The sand and coral bottom is plainly visible. A current sets northeastward along this coast and there are tide rips off Makolea Point. Offshore, beyond the 2,000-fathom curve, the current has been observed to set eastward toward the coast. When a heavy swell is running, breakers extend about 0.5 mile offshore. Strangers should give these points a berth of 1.5 miles. The village of **Mahaiula** is at the head of the unimportant bay between the two points. Between Keahole and Mano Points are several small bays which are rarely used.

Puu Kuili, 5 miles northward of Keahole Point and 0.3 mile inland, is a brown crater 346 feet high. The hill marks the seaward end of a series of cones on the ridge extending from the northwesterly slope of Mount Hualailai. About 2 miles northward of Puu Kuili, and between the villages of **Kukio** and **Kaupulehu,** an extensive shoal extends about 0.5 mile offshore.

Mano Point, 9 miles northeastward of Keahole Point, is a poorly defined, rounded, flat mass of lava.

Kiholo Bay, 11 miles northeastward of Keahole Point, indents the coast 0.5 mile and is 1 mile wide. The head of the bay is foul, but local vessels have anchored close to the black lava shore on the south side. A southwestward current with an average velocity of about 0.5 knot has been observed in Kiholo Bay. The village of **Kiholo** consists of a few houses in a coconut grove at the head of the bay.

Puu Anahulu, 4 miles east of Kiholo, is a prominent yellowish cone, 1,523 feet high, with lava flows on three sides.

Kapalaoa is a village on the south side of a small bight 3.5 miles northeastward of Kiholo. The bight is foul and can only be used by small boats with local knowledge.

Chart 4167.—Puako Bay is a small indentation in the coast 20 miles northeastward of Keahole Point. There is no protection for large vessels and very little is available for small craft. The bay is open to westerly and northwesterly winds and is foul with coral heads and reefs. The shores are mostly black, smooth lava extending into the water on a gentle slope, with many detached rocks of the same material. A small landing is at **Puako,** on the southeast side of the bay, and several houses are along the south shore. A lone eucalyptus tree stands above the algaroba trees 0.2 mile southwestward of the landing.

Small boats can approach the landing on a bearing of 137° until within 250 yards of it; thence a lookout must be maintained to pick out the channel. A reef off **Waima Point,** 1 mile southwestward of Puako, is easily recognized from a safe distance offshore. Anchorage can be found about 0.8 mile northwestward of Puako in depths of 12 to 15 fathoms, sand and coral bottom.

The coast, which has a northeasterly trend to Puako, turns northward for 3 miles, then gradually recurves to the northwest, forming **Kawaihae Bay.** The black lava flows are no longer characteristic, and the back country, with its extensive slopes, is some of the best grazing land in the State.

Kawaihae, 23 miles northeastward of Keahole Point, is a commercial deepwater harbor in the northern part of Kawaihae Bay. The harbor is protected by stone revetment and fill on the south and by a breakwater on the west; the entrance is from northwest.

Prominent features.—Kawaihae Light (20°02.7′ N., 155°50.1′ W.), 59 feet above the water, is shown from a 36-foot white pyramidal concrete tower on the northwest

side of Kawaihae. Deep and heavily wooded **Honokoa Gulch** is northwest of the harbor, and **Kawaihae Heiau** is a square of dark rocks on a 50-foot knoll southeast of the breakwater. **Puu Kamalii**, a mile northeast of Kawaihae, is 690 feet high and fairly conspicuous.

Channels.—Federal project depths are 40 feet for the entrance channel and 35 feet for the main basin behind the breakwater. Project depths were available in 1962. Markers include lighted and unlighted buoys, lights, daybeacons, and a lighted entrance range bearing 120°. Small-boat basins, dredged to 10 feet, are northwest and southeast of the main basin.

Anchorages.—Good anchorage, except in kona weather, may be found in depths of 8 to 15 fathoms between Honokoa Gulch and the outer end of the entrance channel.

Dangers.—Reefs that bare in places extend as much as 0.5 mile from the outer side of the breakwater and from the shore to the southward.

Tides and currents.—The diurnal range of tide is 2.1 feet at Kawaihae. The strong northerly current felt off Keahole Point and Makolea Point passes offshore at Kawaihae, where there is practically no current.

Pilotage.—This is compulsory for all foreign vessels and for United States vessels under register in the foreign trade; it is optional for United States vessels in the coastwise trade. State pilots may be obtained on 24 hours' advance notice and will board, day or night, a mile off the entrance.

Quarantine, customs, and immigration.—Arrangements for inspections should be made in advance through ship's agents.

Harbor regulations.—These are established by the Harbors Division of the Hawaii Department of Transportation and are enforced by the harbormaster.

Wharves.—The State-owned marginal wharf is 600 feet long; a ramp is used for LST-type vessels. State-owned pipelines are available for molasses, liquid fertilizer, and petroleum products. Private bulk-handling facilities and storage are available for sugar, molasses, liquid fertilizer, and petroleum products.

Supplies.—Fresh water is available, and there are several small stores in Kawaihae.

Communications.—Kawaihae has interisland barge and air service and is a port of call for transpacific vessels. Radiotelephone communication is available to the other islands and to the mainland.

Chart 4140.—Between Kawaihae and Mahukona, the country is uncultivated grazing land. Mountain slopes terminate in cliffs at the coast and are cut intermittently by ravines.

Chart 4101.—Mahukona Harbor is a small open bight 10 miles northwestward of Kawaihae and 6 miles southwestward of Upolu Point. The village of Mahukona consists of a few houses in an algaroba grove near the beach. The shore is rocky and the slopes back of the village are partially covered with algaroba trees.

Mahukona Light (20°11.0′ N., 155°54.3′ W.), 64 feet above the water, is shown from a 22-foot white pyramidal concrete tower on **Kaoma Point**, south of the village. Other features include a white daybeacon, conical in shape and 15 feet high, 400 yards southward of the landing and 50 yards north of the light and a similar daybeacon on the southerly side of **Makaohule Point**, 400 yards northward of the landing; the abandoned sugar warehouse at the landing; and the oil tanks and abandoned warehouse on the north side of the bight.

Anchorage may be selected 0.2 mile southwestward of Makaohule Point in depths of 10 to 15 fathoms, sand and coral bottom. An anchorage with less wind can be found 0.3 mile northwestward of the point and about 400 yards off the beach.

Reports indicate that the inshore current usually sets northward with considerable velocity. However, during the period of current observations the average northward drift was about 0.2 knot, both northward and southward velocities of nearly 1 knot were measured, and the tidal current averaged less than 0.2 knot at strength. During the observations winds were light to moderate and variable in direction. Strong offshore winds, accompanied by violent gusts from varying directions, are frequently experienced during the normal northeast trades. Because of these conditions, vessels should anchor with plenty of cable and have a second anchor ready to let go.

The public landing is at the head of the bight and a private landing is on the north shore. Both landings are for small boats only. Power equipment for loading and handling barges is available. Provisions, gasolines, and water are available for small boats. See Appendix for **storm warning displays.**

Chart 4140.—The coast between Mahukona and Upolu Point is a series of low, black bluffs. Back of the bluffs, the country is marked by numerous old blowholes and rises gently to the Kohala Mountains. The cuts and fills of the railroad which formerly skirted the coast from Mahukona to Kohala may be seen when close inshore.

Chart 4115.—Alenuihaha Channel, between the islands of Hawaii and Maui, is 26 miles wide in its narrowest part, between Upolu Point and Pululele Point. The channel is free of obstructions and is deep close to the shores.

During strong trade winds the channel is quite rough and a current of 1 to 2 knots sets westward, but during the calms which frequently follow there is at times an easterly set of about 1 knot, and during kona winds the easterly set may reach a velocity of 2 or 3 knots. The channel is roughest and the westerly current strongest when the wind is between north-northeast and east-northeast. During periods of strong northeast trades violent tide rips may be encountered 2 miles north of Keahole Point, probably caused by the meeting of the southwesterly offshore current with the northerly inshore current. When bound from Upolu Point to Alalakeiki Channel, an onshore set is sometimes felt when reaching the lee of Maui.

MAUI ISLAND (Chart 4116), 26 miles northwestward of Hawaii Island, has an area of 728 square statute miles and is second in size of the eight large islands. The island is 42 miles long in a northwest-southeast direction and 23 miles in greatest width. A low flat isthmus joins the two distinct mountain masses that make up the island. The extinct crater of **Haleakala** (house of the sun), 10,025 feet high, is near the center of the eastern and larger part of the island. On the northwesterly side of the crater the land slopes gently, while on the southerly and easterly sides, it is much steeper and in some places precipitous. **Koolau Gap** on the northerly side and **Kaupo Gap** on the southeasterly side are two large openings in the side of the crater. **Puu Kukui,** 5,788 feet high, is near the center of the western and smaller part of the island, which is cut up by rugged peaks and deep valleys and gulches.

Anchorages are numerous on the southwesterly side of Maui, the first requirement under ordinary conditions being shelter from the trade winds.

Currents.—In the vicinity of Maui currents are variable, depending to a great extent upon the velocity and direction of the wind. Usually there is a westward flow in the offshore areas along the north and south coasts which is part of the general westward oceanic drift accompanying the prevailing northeast trade winds. Much of the flow along the south coast appears to continue westward past the south coast of Kahoolawe. Weak, variable currents are reported in Alalakeiki Channel and there is a northward flow in Auau Channel. Near the shores of the island the currents are complicated by tidal effects, wind, and counter currents.

Weather.—The trade winds divide at Kauiki Head, part following the trend of the coast northwesterly and the other part following the south coast. The winds following the northwesterly coast divide again at the isthmus, part drawing southward and often reaching great force in the vicinity of Maalaea Bay, and the other part following the trend of the coast around the northwesterly end of Maui and through Pailolo Channel, with the greater force on the Molokai side of the channel. That part of the trades following the trend of the south coast of Maui divides, with part continuing along the south shore of Kahoolawe and the other part drawing through Alalakeiki Channel, around the northerly end of Kahoolawe and westward through Kealaikahiki Channel.

On the south coast of Maui a sea breeze frequently sets in about 0900 and continues until after sundown, when the land breeze springs up. Light airs or calms are generally found in the vicinity of Molokini Islet and again along the west shore of Maui between Hekili and Kekaa Points. In the vicinity of Lahaina a light onshore breeze is generally felt, while farther out in Auau Channel the northeast trades are noticed.

Rainfall is quite heavy on the windward side of the island and light on the lee side.

Supplies.—Ship chandlery is available in limited quantities for small craft at Kahului and Wailuku. Provisions are obtainable at these towns and at other large communities on the island. Fuel and water are available at Kahului, Hana, and Mala.

Repairs.—Small vessels can be hauled out at Kahului and some machine repairs can be made.

Communications.—Maui has radiotelephone communication with the other islands and with the mainland. Passenger and freight service travels over good to fair highways which extend to most parts of the island. Kahului is a port of call for interisland and transpacific shipping. The island has regular scheduled air service.

From Hana Bay to Cape Hanamanioa the coast has a generally west-southwesterly trend. Between Hana Bay and Nuu Landing the coast consists of high, rough bluffs, broken up by numerous small capes and indentations. Vegetation may be seen as far as Kaupo Gap. The entire south face of Haleakala is steep and eroded, presenting a reddish-brown appearance, dotted here and there with green patches. The slopes become less steep as the shore is approached. From Nuu Landing to Cape Hanamanioa the coast is bare, with practically no sign of habitation. Dangers lie offshore in the vicinity of Alau Island, Ahole Rock, and between Pohakueaea Point and Cape Hanamanioa. Otherwise the 10-fathom curve lies wtihin 0.2 mile of the shore. Landings can be made during tradewind weather in the numerous coves along the coast between Muolea Point and Nuu Landing. There are no suitable anchorages between Nuu Landing and Cape Hanamanioa.

Chart 4113.—Hana Bay lies between Kauiki Head and Nanualele Point at the easterly end of Maui. The bay is about 0.4 mile in diameter and is open to the eastward. **Hana** (1960 pop. 435; P.O.) is a commercial barge harbor on the south side of the bay.

Kauiki Head, on the south side of Hana Bay entrance, is an extinct crater 390 feet high; the outer half of the crater has eroded, leaving the inner side exposed. Because it is joined to the rest of Maui by a comparatively low neck of land, Kauiki Head has the appearance from a distance of a separate island. **Kauiki Head Light (20°45.6′ N., 155°58.9′ W.),** 85 feet above the water, is shown from a 14-foot white pyramidal concrete tower on an islet close to the northeast side of the crater.

The shores of Hana Bay are rocky except for two short beaches, one at the south end of the bay, and the other on the northwesterly side. A shoal, usually marked by breakers, extends halfway across the bay from the middle of the north shore. A small, 16-foot rocky shoal, marked by a buoy on its south side, lies 350 yards north of the light. Numerous rocks, some bare at all tides, extend for 200 yards off **Nanualele Point.** The point is low, flat lava on the north side of Hana Bay. **Twin Rocks** are two bare rocks, with deep water close-to, lying about 300 yards northeastward of the light; the inner and larger rock is 15 feet high. About 200 yards southward and 300 yards southeastward of outer Twin Rock lie **Inner Pinnacle Rock,** about 3 feet high, and **Outer Pinnacle Rock,** about 5 feet high.

The entrance channel to Hana Bay lies between Twin Rocks and a buoy marking a 16-foot shoal. An unlighted range marks the channel on bearing 239°. A local rule is to avoid entering the harbor when the seas are breaking over the buoy at the entrance.

The bay does not afford a desirable anchorage. Small vessels sometimes anchor in the southwest portion of the bay, but swinging room is limited. Anchorages in the bay are exposed to northeast winds and sea, and during strong southwesterly blows vessels are apt to drag anchor. In the absence of local knowledge, anchorage should be attempted only by small craft.

Currents.—Just outside the bay a tidal current reaches its southward strength when the tide at Honolulu is rising and its northward strength when the Honolulu tide is falling. Southward and northward velocities of about 1 knot and 1.5 knots, respectively, have been observed. Farther offshore, a strong northward or northeastward current has been reported. Off Kauiki Head and Nanualele Point rough seas occur when a northeast wind blows against the northeastward current.

No breakwater protects this small exposed harbor. The turning basin is 20 to 30 feet deep and about 600 feet by 800 feet. The State-owned T-pier provides a cargo shed and 300 feet of berthing space; private facilities include bulk-handling and storage for petroleum products. Vessels drop anchor northeastward of the pier and make a starboard landing; lines are run to the mooring buoys. Gasoline and groceries may be obtained on the pier. See Appendix for **storm warning displays.**

Chart 4116.—Puu o Kahaula, 545 feet high, is the highest of five hills 0.7 mile inland from Hana; the stone memorial cross atop the hill is sometimes lighted at night.

Alau Island, 1.5 miles south of Kauiki Head and 0.4 mile offshore, is 100 yards in diameter and 150 feet high, is grass-covered and has a few coconut palms. Between the island and Maui is an extensive reef. Tidal currents of 0.5 knot, setting northward and southward, have been observed near Alau Island. Off the island is a strong northeastward current and there is an eddy between the island and Kauiki Head.

Two rocks with about 9 feet of water over them lie close together about 0.7 mile southeastward of Alau Island. Under favorable conditions, these rocks appear as small, yellowish-brown spots in the water. However, they are seldom seen and do not break in moderate seas. Vessels may avoid the rocks by giving Alau Island a berth of about 1.5 miles in passing.

Iwiopele, about 1.5 miles south of Hana Bay, is a formation similar to Kauiki Head and resembles the latter in size and appearance.

Mokae Cove, almost 1 mile south of Iwiopele, affords a landing for small boats in northeast weather. Southward currents wtih velocities up to 0.5 knot have been observed 0.5 mile from the shore in this locality.

From **Makaalae Point,** 3 miles south of Kauiki Head, the coastal trend is southwestward. There are several villages between Mokae Cove and Wailua Cove. A church spire is prominent on the bluff at **Puuiki,** 4 miles from Kauiki Head.

Wailua Cove is at the mouth of a valley 6 miles from Kauiki Head. Inland from the cove and halfway up the mountain is a high waterfall which is usually conspicuous from offshore. Landings may be made during normal trade-wind weather in almost any of the coves along this coast, although the swell enters all of them. **Muolea Point,** a mile eastward of Wailua Cove, is rounded and rocky.

Kipahulu, 8 miles southwest of Kauiki Head and 0.5 mile west of **Puhilele Point,** is a ranch settlement on the western side of deep **Kipahulu Valley**; a stack is prominent. **Ahole Rock,** about 0.3 mile off the shore below Kipahulu, is low, flat, and has a bare appearance; anchorage in the vicinity is not recommended.

Kaapahu Bay, 1.5 miles west of Kipahulu, is a small coastal dent which sometimes can be used for small-boat anchorage in trade-wind weather; there are depths of 4 fathoms about 200 yards off the pebble beach.

Kaupo Landing, 11 miles southwest of Kauiki Head, is the best in the vicinity during trade-wind weather. Adjacent land is divided into small homesteads, and cattle raising is the principal occupation. Vessels anchor well off and east of the landing. Strong easterly winds make landings difficult.

Kailio Point, 13 miles southwest of Kauiki Head, is 73 feet high, narrow, and at the eastern end of **Mamalu Bay.** A prominent church is on the highway directly north of the point. Trade-wind anchorage may be found about 300 yards from the head of the bay in depths of 10 fathoms, sandy bottom.

Kaupo Gap is the large opening, about 1.3 miles wide, in the southeastern side of Haleakala Crater. An immense old lava flow slopes gradually from the gap to the coast. The wide U-shaped gap at the top is a good landmark, day or night, for Kailio Point. The brush-covered lava flow is the dividing line between the forest and brush of the eastern part and the barren western part of the south coast. Waterfalls are numerous east of the gap.

Low **Apole Point,** 15 miles southwest of Kauiki Head, is composed of black, jagged rock. The point marks the seaward end of the Kaupo lava flow.

Nuu Landing is a small bight on the west side of Apole Point. Small vessels can find anchorage in depths of about 8 fathoms.

From Nuu Landing to **Pohakueaea Point,** 12 miles to the westward, the coast is barren and deep water is close-to. All dangers are close to the bluffs. A few homesteads may be seen on the slopes that rise to the rim of Haleakala. The slopes are cut by gulches and are barren except for a scattering of trees about halfway up. At Pohakueaea Point the 20-fathom curve begins to trend offshore.

A pinnacle rock with depths of less than 12 feet over it is reported to exist within 0.5 mile of the shore somewhere between Pohakueaea Point and La Perouse Bay. The rock may be off Pohakueaea Point as an extension of the lava flow which forms the point. Vessels making the run

along this coast in recent years have observed no indication of an offshore danger; however, they give Cape Kinau a berth of about 1 mile as it is known that a steamer struck bottom in the vicinity of the cape, probably about 0.2 mile offshore.

Lualailua Hills, 7 miles westward of Nuu Anchorage and 2 miles inland, are a group of red mounds about 2,000 feet high.

Hokukano, 1 mile southwestward of Lualailua Hills, is a conspicuous red cone with a lava flow reaching the sea in a high black mass.

Pimoe, 2.4 miles westward of Hokukano, is a red dome irregular in shape with its easterly side broken. The dome, 1,766 feet high, is the crater from which the large, fan-shaped lava flow in the vicinity of Pohakueaea Point had its origin.

Chart 4130.—Cape Hanamanioa, the southwestern extremity of Maui, is a black lava mass. **Hanamanioa Light (20°35.2′ N., 156°24.9′ W.),** 73 feet above the water, is shown from a 21-foot white skeleton tower on the cape. A current is reported to set constantly northwestward past the cape; however, a short series of observations a mile southeast of the light indicates a tidal current with a velocity of 0.8 knot at strength.

La Perouse Bay (Keoneoio), between Cape Hanamanioa and Cape Kinau, is about 0.7 mile wide and indents the coast about 0.5 mile. On the northwest side of the bay is **Puu o Kanaloa,** a low, yellowish-brown cone at the water's edge, with its seaward side blown out. The crater is surrounded by a lava flow from **Kalua o Lapa,** a small black cone about 1 mile northward of the bay. A rock with 10 feet of water over it is in the middle of the entrance to the bay and the bottom is rocky. Strangers are advised not to use the bay.

Cape Kinau, 1.5 miles northwest of Cape Hanamanioa, is a broad, low, black, lava point. A rock with 4½ feet of water over it is 400 yards offshore near the northerly end of the cape.

Puu Olai, about 2.5 miles northward of Cape Kinau, is the most prominent landmark in this vicinity. The hill is brown in color, 367 feet high, and consists of three bare knolls, of which the southernmost is the highest. The red and white poles of an aviation radio range station are just east of the hill.

Molokini, 5.5 miles northwestward of Cape Hanamanioa, is a small crescent-shaped islet about 0.3 mile long and 156 feet high. The islet is the bare southern rim of an extinct crater, the northern part of which is submerged. **Molokini Island Light (20°38.0′ N., 156°30.0′ W.),** 188 feet above the water, is shown from a white skeleton tower. A reef extends 300 yards northward from the northwesterly end of the islet; there is deep water close to the southern side. Vessels pass on either side of the islet.

Makena Anchorage, 1 mile northward of Puu Olai, is exposed to kona weather, but affords good holding ground during the trades. Anchorage can be had in depths of 12 to 15 fathoms off **Nahuna Point,** with a fairly prominent church bearing 100°. A few houses may be seen among the trees on the rocky point at the north side of the bight, and a prominent house is at the southern end of the sand beach. The strong trade winds which are felt further north in Maalaea Bay are not pronounced at Makena. Secondary roads lead along the coast and inland from the village. Anchorage can also be found in **Ahihi Bay,** just south of Puu Olai.

The country back of Makena rises gently to the mountains. The lower slopes are covered with cactus, while the slopes higher up are wooded in places. From Makena to Kihei the coast has a general northerly trend and is low and thickly covered with algaroba trees. The country back of the coast is like that in the vicinity of Makena.

Keawakapu is 8 miles north of Cape Hanamanioa. An **artificial fishing reef,** 200 yards by 1,150 yards, is 0.7 mile southwest of Keawakapu.

Chart 4104.—Maalea Bay is a large bight midway along the southwest coast of Maui. The shores are low, mostly sandy, and fringed with algaroba trees. The isthmus behind the bay and the slopes on either side are covered with vegetation.

Because of the fresh winds that sweep across the isthmus during the trades, Maalea Bay is only a fair anchorage. A northwestward current has been reported in the bay. In the central and eastern portions the bottom is very irregular. A reef fringes the shore for a distance of 3.5 miles south of Kihei. Off Kalepolepo, where the reef is widest, a 14-foot spot is 0.5 mile offshore along the edge of the reef. Broken ground with a least depth of 3 fathoms lies about 0.7 mile west-southwestward of the Kihei wharf. A shoal with a least depth of 7 fathoms is in the center of the bay. Strangers should pass well offshore.

Kalepolepo, on the eastern side of Maalea Bay and 11 miles northward of Cape Hanamanioa, is the location of **WWVH, the radio station** from which the National Bureau of Standards broadcasts time signals at all hours of the day or night; see Chapter 1. A large old fishpond extends 0.2 mile from shore. Local sampans anchor behind the reef in depths of 3 to 4 feet.

Kihei (1960 pop. 938; P.O.) is on the eastern side of Maalea Bay and 12 miles northward of Cape Hanamanioa. A ranch settlement is scattered among the trees in the vicinity of the wharf. The wharf has a depth of 7 feet at its outer end, and is used occasionally by sampans to unload, but there is generally too much swell to lie alongside. The small dockhouse and derrick are prominent. Anchorage can be found in depths of 6 fathoms 700 yards off the wharf.

Kealia Pond, just northwestward of Kihei, is separated from the bay by a narrow sand strip over which the shore highway passes.

Maalaea is a village on the northwestern shore of Maalaea Bay. A few buildings can be seen among the algaroba trees. The boat harbor at the village is about 500 yards long east-to-west, about 200 yards across, and is protected by breakwaters. Depths in the harbor are about 7 feet. The entrance is marked by a **339° lighted range.** See Appendix for **storm warning displays.**

Chart 4130.—McGregor Point, marked by the concrete structure of an abandoned lighthouse, is on the western side of Maalaea Bay. The coast between McGregor Point and Olowalu is broken by low bluffs rising from the water's edge, behind which the country presents a barren appearance. The mountains have sharp jagged peaks and are cut by deep gorges.

Papawai Point, 0.9 mile west of McGregor Point, is the southernmost point of western Maui. Deep water is close inshore at the point.

Olowalu is on **Hekili Point,** 18 miles northwest of Cape Hanamanioa. The deep gulch of **Olowalu Stream** appears as a gap in the mountains when abreast of the point and is an excellent night mark.

Launiupoko Point, about 2 miles northwest of Olowalu, is low and rounding. About 0.8 mile inland from the point is an 808-foot hill which has a mottled, grayish-brown appearance. Shoal water extends about 0.2 mile offshore from the point northwestward to Lahaina. The highway skirts the shore between these points, and automobile lights along the road are usually the only lights seen along the coast.

Lahaina (1960 pop. 3,423; P.O.) is situated among the trees immediately in from the beach about 23 miles northwest of Cape Hanamanioa. The principal landing is at **Mala,** on low, tree-covered **Puunoa Point,** a mile northwest of Lahaina.

Lahaina Light (20°52.5′ N., 156°40.9′ W.), 44 feet above the water, is shown from a 39-foot white pyramidal concrete tower at the inner end of the Lahaina small-boat wharf. A tall, concrete mill stack is 0.4 mile northward of the light.

South of Lahaina wharf is a boat basin, about 200 by 800 feet, protected by breakwaters. The entrance channel, dredged to 12 feet, is marked by buoys, daybeacons, and a **045° lighted range,** all privately maintained. See Appendix for **storm warning displays.**

Off Lahaina is good anchorage, and calm water will generally be found even though strong trade winds are blowing elsewhere. However, the anchorage is exposed in kona weather. In approaching this anchorage vessels should keep about 1 mile offshore until the light bears 056°, then head in on this course and anchor in depths of 9 to 15 fathoms. Anchorage can be had anywhere in the bight north of Mala wharf, 0.6 mile offshore in depths of about 12 fathoms, sandy bottom.

The concrete wharf at Mala is used by tugs, barges, and smaller craft, which generally breast off, as a swell picks up quickly. The depth at the face of the wharf is about 30 feet. The town has a hotel. Supplies are available in limited quantities for small craft.

Currents.—The current off Lahaina usually sets northward and reaches a maximum velocity of 1 or 2 knots before low water. Before high water the current is normally quite weak and may set either northward or southward.

A confused current makes it difficult to approach or lie at the wharf at Mala at times. It is reported that the current at the wharf sets southward most of the time and that the best time to approach the wharf is at or soon after high water.

A reef, over which the sea generally breaks, extends about 0.2 mile off Puunoa Point, southwest of the wharf. A lighted buoy marks the edge of the reef.

In the vicinity of Lahaina, canefields extend along the coast and for several miles inland on the ridges that lead to high, rugged rountains. The coast between Mala and Kekaa Point consists of a low, sandy beach with a fringe of coconut and algaroba trees, back of which the canefields extend inland for about 2 miles.

Puu Laina, 1.2 miles northeastward of Mala, is a prominent cone 647 feet high. The lower slopes of the hill are covered with cane.

Hanakaoo Point, 2 miles north of Mala, is rounding and not conspicuous from offshore. The 10-fathom curve is about 500 yards off this point, and the bottom slopes gradually to the sandy beach.

Kekaa Point, 26 miles northwest of Cape Hanamanioa, is the westernmost extremity of Maui. The point is a dark, rocky promontory, 85 feet high, which appears detached from a distance; there are no offshore dangers. A hotel has been built on the point.

A northward current is reported off Kekaa Point. A tidal current of 0.5 knot, setting northward and southward, was observed 0.5 mile from the shore.

From Kekaa Point to Lipoa Point, the coast consists of low bluffs and stretches of sand beach along which may be seen clumps of algaroba trees. The gently-sloping country is cut by shallow gulches and is covered with cane and pineapple which extend well up the mountain slopes.

Napili Bay, 4.5 miles northward of Kekaa Point, is a small bight between two coral reefs. Anchorage can be found about 0.5 mile offshore in depths of 5 fathoms, but it is seldom used. Northerly currents are reported off the bay. Small boats can land in Napili Bay during tradewind weather. Breakers extend 0.2 mile offshore for a distance of 1.5 miles southward of the bay.

Hawea Point Light (21°00.4′ N., 156°40.2′ W.), 75 feet above the water, is shown from an 18-foot white pyramidal skeleton tower 5 miles northward of Kekaa Point.

Honolua Bay is the open bight on the south side of **Lipoa Point,** which is 7 miles northeastward of Kekaa Point. Small boats can find fair anchorage in the bay and can land in the cove at the northeastern end.

In the vicinity of Lipoa Point, the bluffs along the northern shore of Maui become higher and more precipitous. Also, the bluffs are cut up by more bights and headlands. The country is more rolling and is cut by deeper gulches. The mountains are steeper and greener. Near their tops the mountains are wooded in places. Patches of black rocks, awash at high water, are found close inshore off several of the points in the vicinity. Vessels should give this coast a berth of at least 0.8 mile.

Kanounou Point, about 2 miles east-northeastward of Lipoa Point, has several bare, black rocks a short distance offshore.

Honokohau, on the west side of Kanounou Point, con-

sists of a few houses at the mouth of **Honokohau Stream.** There is little protection off the village, which is the last settlement on the road that skirts the western shore of Maui.

Nakalele Point is 3 miles east-northeastward of Lipoa Point; close off Nakalele Point are several bare, black rocks. **Nakalele Point Light (21°01.9′ N., 156°35.6′ W.)**, 166 feet above the water, is shown from a 45-foot white skeleton tower.

Chart 4124.—Kahakuloa Head, 3 miles southeastward of Nakalele Point, is the seaward end of one of the numerous abrupt capes in this general vicinity. **Puu Koae (Sugarloaf)**, a dark, bare, conical mound 634 feet high, is on Kahakuloa Head; this feature is one of the most conspicuous landmarks on the island of Maui. Eastward and close to Puu Koae, on the same ridge, is a low and more rounded dome. **Kahakuloa** is a small village in **Kahakuloa Bay,** just west of Kahakuloa Head. Deep water is found close to the head, although there are numerous breakers and covered rocks just offshore. A rock covered by 3 feet, in surrounding depths of 20 fathoms, lies 0.4 mile off the head in the cove between Puu Koae and Mokeehia Island.

Mokeehia Island, 1.4 miles southeastward of Puu Koae, is a large, bare rock 170 feet high, just off the outer end of **Hakuhee Point.** Caverns can be seen in the faces of the cliffs on both sides of the island.

Puu Olai, 0.7 mile inland from Mokeehia Island, is 1,002 feet high and is at the northern end of the road from Wailuku.

Hulu Islets, 2 miles southward of Mokeehia Island, are several rocks close to shore. The highest rock has an elevation of 95 feet.

Waihee Point is 2.6 miles southward of Mokeehia Island. Southeastward of the point is extensive **Waihee Reef,** and back of the point is deep and precipitous **Waihee Valley,** which is quite prominent.

Iao Valley, also deep and precipitous, is 6 miles south of Mokeehia Island; some of the finest scenery on Maui is found in this vicinity.

Wailuku (1960 pop. 6,969; P.O.), at the mouth of Iao Valley and 1.5 miles from the coast, is the seat of Maui County and is the largest town on the island. The town has hotels and numerous stores, and there is a direct highway to Kahului.

Kahului Harbor, 6 miles southeast of Mokeehia Island, is protected by breakwaters which extend outward from west and east shores. On the southeast side of the harbor is the commercial deepwater port of **Kahului** (1960 pop. 4,223; P.O.).

Prominent features.—Pauwela Point Light (20°56.9′ N., 156°19.5′ W.), 169 feet above the water, is shown from a 47-foot white pyramidal skeleton tower 9 miles east-northeastward of Kahului Harbor and is the principal mark for the approach. Other marks are the breakwater lights, the lighted entrance range, the powerplant stacks east of the piers, the radio tower 0.8 mile west of the rear range, and the Wailuku spire and stack 2 miles west of the harbor.

Channels.—From deep water on the north, the channel leads between the breakwaters, then turns sharply southeastward to the Kahului piers. A Federal project provides for an entrance channel 35 feet deep and a harbor basin of the same depth. Channel and basin are maintained at or near project depth; markers include lighted and unlighted buoys, the breakwater lights, and the **177° lighted range.**

Anchorages.—Swinging room inside the breakwaters is too restricted for large vessels, which usually anchor in depths of 9 to 12 fathoms, hard bottom, about 0.5 mile east of the sea buoy. There is plenty of anchorage room for small craft in the unimproved areas behind the breakwaters.

Dangers.—Waihee Reef, northwest of the breakwaters, and **Spartan Reef,** on the northeast, extend nearly a mile from shore. Vessels approaching from either direction should avoid that one-mile danger line until entrance range is reached. The western part of the inner harbor is shallow.

Tides and currents.—The diurnal range of tide is 2.3 feet at Kahului. Harbor currents are weak.

Weather.—The prevailing winds are the northeast trades. See Appendix for **storm warning displays.**

Pilotage.—This is compulsory for all foreign vessels and for United States vessels under register in the foreign trade; it is optional for United States vessels in the coastwise trade. Pilots will board, day or night, in the vicinity of the sea buoy if given suitable advance notice of arrival. The 65-foot pilot boat is painted red and is equipped with radiotelephone.

Towage.—Two tugs are available at Kahului for docking and undocking vessels.

Quarantine.—Vessels are boarded at the pier. The U.S. Public Health Service maintains an outpatient office in the port. There is a non-Government hospital between Kahului and Wailuku.

Customs.—Kahului is a customs port of entry; vessels are boarded at the piers.

Immigration.—This is handled by a deputy collector of customs.

Harbor regulations.—These are established by the Harbors Division of the Hawaii Department of Transportation. The harbormaster enforces the regulations and assigns berths and anchorages.

Wharves.—One State-owned wharf provides 1,230 feet of berthing space; a pier, used as a wharf since deep water exists on one side only, provides two cargo sheds and 890 feet of berthing space. State-owned pipelines are available for petroleum products, molasses, and liquid fertilizer. Private facilities include bulk-handling and storage for sugar, molasses, liquid fertilizer, and petroleum products. There is a constant surge at the piers during the northeast trades; and departing vessels may have some difficulties in breasting off from Pier No. 1 during kona weather.

Supplies.—Fuel and fresh water are available on the

State piers. Ice, provisions, and some ship chandlery may be obtained in Kahului. Deck and engine stores not available locally may be obtained by air from Honolulu.

Repairs.—A marine railway at Kahului can haul out vessels up to 100 feet in length. The local machine shops can make minor repairs.

Communications. — Kahului has regular interisland barge service and is a port of call for transpacific vessels, but interisland passenger travel is almost entirely by air. Radiotelephone communication is available to the other islands and to the mainland.

The coast is low between Kahului Harbor and Pauwela Point. The back country is planted in sugarcane and pineapple.

Paia (1960 pop. 2,149; P.O.) is 6 miles east of Kahului Harbor and a mile inland. An opening in Spartan Reef off Paia is sometimes used by local craft seeking anchorage behind the reef.

Maliko Bay, 8 miles east-northeastward of Kahului Harbor, is a narrow opening with steep, rocky sides. The bay provides fair anchorage for small craft in depths of 4 fathoms, rocky bottom, when the trade winds are blowing; rocks extend halfway across the entrance from the east side and form a natural breakwater.

Pauwela Point, 9 miles east-northeastward of Kahului Harbor, is marked by a prominent light which has already been described. An eastward current is reported off the point. **Pauwela** (1960 pop. 558) is a mile inland. Back of Pauwela are several hills with heavily wooded tops.

Chart 4116.—Paralleling the northeast coast of Maui is a State highway which is the main link between Kahului and Hana. From Pauwela east the road is a succession of sharp turns and steep grades as it winds from and toward the shore in crossing the numerous gulches. Sections of the highway can be seen from seaward but it disappears as it follows the gulches inland.

Between Pauwela and Nahiku, a distance of about 15 miles, the bluffs reach heights of 300 to 400 feet, then gradually lose elevation to the southeastward and are low in the vicinity of Hana. The back country is generally green and the higher slopes are heavily wooded. Because of the heavy rains, waterfalls are numerous in the many gulches that lead to the sea. Very little of this northeast coast is planted in sugarcane. From Pauwela Point to Waipio Bay the land on the seaward side of the coastal highway is under pineapple cultivation, and there are many taro patches at Keanae and Nahiku. The slopes southeast of Nahiku are grazing areas for cattle. There are many inshore rocks between Pauwela Point and Hana but all such dangers can be avoided by keeping a mile offshore.

Uaoa Bay, 3 miles east of Pauwela Point and just east of **Opana Point,** indents the coast about 0.4 mile. Fair anchorage during southerly winds can be had 0.3 mile offshore in depths of 12 to 16 fathoms, sandy bottom. A large detached rock off Opana Point marks the western side of the bay.

Pilale Bay, 4 miles east of Pauwela Point, is a small opening at the mouth of a deep valley. Small boats can find fair anchorage during trade-wind weather in depths of 4 to 7 fathoms a short distance off the beach.

Waipio Bay, 6 miles eastward of Pauwela Point, lies between **Honokala Point** and **Huelo Point** and is open to the northeast. **Huelo** is a small village along the highway 0.5 mile inland; a church steeple is fairly prominent from seaward.

Hoalua Bay, 7 miles southeastward of Pauwela Point, is small and too exposed for anything but emergency anchorage. Under favorable conditions landings can be made at the head of the bay.

Oopuola Cove, 8 miles southeast of Pauwela Point, is narrow and steep-sided. A reef lies just north of the point on the west side of the entrance. Beach landings can be made at times, and small boats can find anchorage in depths of 3 to 6 fathoms near the center of the cove. **Puu Kukai,** 574 feet high, is 0.5 mile west of the cove.

Keopuka Rock, 141 feet high, is 9.5 miles southeast of Pauwela Point and close to shore. The rock's double-humped top is distinctive from east or west but from directly offshore it blends into the cliffs behind it.

Honomanu Bay, 10 miles southeast of Pauwela Point, is a good landing place and a fair small-boat anchorage during the trades, although the swell is felt in the bay. Anchorage can be found in depths of 2 to 3 fathoms about 200 yards from the black shingle beach at the head of the bay. The east side of the bay is shallow. **Puu o Kohola,** 844 feet high, is 0.5 mile west of the bay.

Nuaailua Bay, close eastward of Honomanu Bay and on the west side of Keanae Point, is the only suitable anchorage for moderate-size vessels along this northeast coast. The bay is somewhat exposed to the northeast trades but is partly protected by Keanae Point. A 250-foot vessel can anchor in depths of 13 to 15 fathoms in the middle of the main bay; the bottom is quite even and has good holding qualities. Approach from seaward should be made on a due south course, keeping about 0.3 mile off the western shore and well clear of the 15-foot lone, black rock which lies 0.3 mile off the eastern shore.

Keanae Point, 11 miles southeast of Pauwela Point, is a low, flat peninsula that juts out 0.3 mile from the bluff line. Landings should not be attempted on the point proper because of the covered rocks and ledges on all sides.

Keanae Valley is the largest and most prominent valley on this part of Maui. The valley leads inland 7 miles from the vicinity of Keanae Point to **Koolau Gap,** the large opening in the northern rim of Haleakala Crater.

Pauwalu Point is a mile southeast of Keanae Point. **Mokumana Rock,** close off Pauwalu Point, is 77 feet high and flat-topped; the rock is particularly outstanding when approached from the east, but from some directions it appears to be a continuation of the point although there is a separation of some 50 yards.

Aluea Rock, 2 miles southeast of Keanae Point and about 0.2 mile offshore, is only a few feet high and has the appearance of a reef awash as the seas break over it continuously and covered rocks extend another 300 yards from shore. This area should be avoided by all boats.

Wailua consists of a few houses along the shore of the small bight immediately southward of Aluea Rock. On the east side of the bight is a high wooded bluff, and the west side is low and grass-covered. The highway leading to Hana leaves the shore west of the bight and from seaward it may be seen high up on the ridges as it winds its way southeastward.

Nahiku, 15 miles southeast of Pauwela Point, is a small settlement on the east side of an open bight. Anchorage can be found in depths of 7 fathoms close to shore but strangers should not attempt it because of the two covered rocks near shore. A southeastward current is reported off Nahiku, and the inshore current between Nahiku and Kauiki Head is said to be weak. **Kuhiwa Gulch** extends inland from the vicinity of Kahiku and is visible from seaward.

Opikoula Point is a low, rocky bluff on the east side of the Nahiku anchorage. Similar bluffs extend 5 miles southeastward to Pukaulua Point and there are no easily recognized landmarks. This reef-fringed stretch of coast is not recommended for small-boat landings.

Low **Pukaulua Point** is 2.5 miles north-northwest of Hana Bay and Kauiki Head. **Hana Airport** is a half mile northwest of the point; the main runway is laid out in an east-west direction and is close to the bluffs.

Chart 4130.—Alalakeiki Channel, between Maui and Kahoolawe, is about 6 miles wide. The channel is clear of dangers, with the exception of Molokini, which is marked by a light.

Observations made in 1962 show the current to be variable with a general northwesterly drift of about 0.5 knot along the west side of the channel and a general light southeasterly drift on the east side. The maximum observed velocity of the current was 1.0 knot.

The trade winds draw through the channel, hauling around the north end of Kahoolawe. The trades blow with much force at the easterly entrance to the channel, but in the vicinity of Molokini it is generally calm.

Auau Channel, between Maui and Lanai, is about 8 miles wide. With the exception of a reef about 3 miles long, which extends not more than 0.5 mile offshore northward of Kikoa Point, Lanai, the channel is free from obstructions.

Current observations made in Auau Channel in 1962 show the current to be reversing with velocities averaging between 0.3 and 0.6 knot. Maximum velocities of 2 knots were observed. The flood sets generally westward and the ebb eastward. For daily predictions see the Tidal Current Tables. During trade winds it is often calm in the channel. The aviation light at Molokai airport can be seen when passing through Auau Channel.

Pailolo Channel, between Maui and Molokai, is about 7.5 miles wide. The channel is clear of obstructions with the exception of Mokuhooniki and Kanaha Rock, near the easterly end of Molokai, and a reef about 0.8 mile wide which fringes the shore of Molokai.

Observations made in 1962 show the currents in the channel to be weak and variable. The maximum velocity observed was 0.6 knot.

In navigating this channel, the tanks on Molokai and Maui will prove useful landmarks; those on Molokai are on the southeasterly shore, near Pukoo, and those on Maui are on its west-northwesterly side, near Kekaa Point.

KAHOOLAWE ISLAND (Chart 4130), 6 miles westward across Alalakeiki Channel from the southwestern extremity of Maui, has an area of 45 square statute miles and is the smallest of the eight major islands. Kahoolawe is about 10 miles long and 6 miles wide, and from a distance has an even, unbroken appearance. The high cliffs on the eastern and southern sides are almost black, while the soil of the mountain tops and the gentle slopes of the northern and western sides are reddish in color. The island has scarcely any rainfall and the huge clouds of red dust which trail to leeward during strong winds can be seen for many miles. **Moaula,** a brown dome 1,444 feet high near the easterly end of the island, is the most prominent landmark.

Warning.—Kahoolawe is under Naval jurisdiction and is closed to the public. The **danger zones** of an aerial bombing target and a naval shore bombardment area extend 2 miles from all sides of the island; **see 204.223, Chapter 2, for limits and regulations.**

From **Cape Kuikui,** the most northerly point of the island, to Kanapou Bay, the coast is rocky and the bluffs gradually increase to cliffs several hundred feet high at the bay.

Ule Point, 2.8 miles southeast of Cape Kuikui, is on the northern side of Kanapou Bay.

Kanapou Bay, 2 miles wide between Ule Point and **Halona Point,** offers protection in kona weather. Anchorage is available for small vessels in **Beck Cove** on the southwest side of the bay. The bay should be entered on a southwesterly course, heading for the middle of the cove, and anchorage should be made in depths of 15 to 20 fathoms off the mouth of the cove and midway between the sides. The bottom shoals rapidly from depths of 12 to 3 fathoms about 0.2 mile from the sandy beach at the head of the cove. Westerly winds draw down the canyon at the head of the cove with considerable force.

From **Kaka Point,** the southeastern point of Kahoolawe, to within 1 mile of Smuggler Cove on the southwest side, the coast consists of sheer cliffs which reach a maximum height of 800 feet at Kamohio Bay. There are no off-lying dangers except Puukoae Island.

Kamohio and **Waikahalulu Bays,** 3 and 6 miles west of Kaka Point, each indent the coast about 0.7 mile. Neither bay can be recommended as an anchorage because of the deep water close to the shores. The bays are subject to strong gusts of wind which sweep down over the high cliffs when the trades are blowing. On the west side of Kamohio Bay is **Puukoae Island,** a black mass of rocks 378 feet high and about 100 yards offshore.

Kahoolawe Southwest Point Light (20°30.3′ N.,

156°40.2′ W.), 140 feet above the water, is shown from a 40-foot white skeleton tower on the southwestern end of Kahoolawe Island.

The prevailing current along the south coast of Kahoolawe Island is westerly.

Smuggler Cove is 1 mile southeastward of **Kealaikahiki Point,** the westernmost point of the island. The cove is the best anchorage on the island except during westerly or southerly weather. Anchorage can be had in depths of 10 to 12 fathoms 0.5 mile off the sand beach. The prevailing current at the anchorage is northwesterly. The best landing is on the sand beach close to the conspicuous black rock at the head of the cove. The shore is low and has alternate stretches of sand and rocks. A stream, which is usually dry, and a clump of algaroba trees may be seen.

Kuia Shoal, with a least depth of 1 fathom, extends 0.7 mile westward from Kealaikahiki Point. A shoal with a least depth of 3 fathoms is about 0.5 mile southwestward of Kuia Shoal. Vessels should give the point a berth of at least 1.5 miles. The country slopes up evenly from Kealaikahiki Point to the eastward.

The northwest coast is rocky and has a line of low bluffs from which the country slopes gently up to the reddish hills in the center of the island. There are scarcely any distinguishing marks and no off-lying dangers.

Kuheia Bay, 2 miles southwestward of Cape Kuikui, is a very small bight where boats can land at times. Two or three buildings may be seen on the shore of the bay.

Kealaikahiki Channel, between Kahoolawe and Lanai, is about 15 miles wide. The channel is free from obstructions. Currents in the channel are weak and variable and are influenced by the wind. A maximum velocity of 0.5 knot in a general northeastward direction was observed in 1962. Sailing vessels should avoid this channel during trade winds, as long periods of calms sometimes occur southward and westward of Kahoolawe and Lanai.

LANAI ISLAND (Chart 4116), 8 miles westward across Auau Channel from Maui and the same distance southward across Kalohi Channel from Molokai, has an area of 141 square statute miles and ranks sixth in size of the eight major islands. Lanai is about 15 miles long in a northwesterly direction and about 10 miles wide near its southerly end, gradually narrowing toward its northwesterly end. The highest point on Lanai is **Lanaihale,** 3,370 feet high and 3.5 miles inland from the southeastern side of the island. The slopes on the easterly side of the mountain are steep and cut by gulches, while those on the westerly side are more gradual, terminating in a rolling plain between the 1,000- and 2,000-foot levels. There is little rainfall and, in general, the island has a barren appearance. The central portion of the island is covered with extensive pineapple fields which, because of their position on a high plain, are not easily seen from the sea. Pineapple cultivation is the principal occupation, although some livestock is raised. **Lanai City** (1960 pop. 2,056; P.O.), the only large community, is in the center of the island.

Chart 4130.—The coast is low, sandy, and brush-covered from **Kikoa Point,** the easternmost point of Lanai, to **Kamaiki Point,** 3.1 miles south-southwestward. A coral reef and shoal water fringe the shore from 200 to 400 yards off the beach. Low bluffs appear at Kamaiki Point, gradually increasing in height until close to Manele Bay, where they reach a maximum of about 400 feet.

Manele Bay, 3 miles southwest of Kaimaiki Point, has an entrance width of 0.3 mile and an inland extent of 0.3 mile. The shores of the bay are mostly rocky but there is a sand beach at the head. The small-boat basin in the westerly corner of the bay is protected by a short boulder groin; the basin has been dredged to depths of 5 feet. There are no supply or repair facilities at the basin, but a good hard-surface highway connects with Lanai City.

A low rock, over which the sea usually breaks, is 300 yards seaward from the entrance point on the east side of Manele Bay. Small local vessels have anchored in depths of 14 fathoms about 350 yards southwestward of the rock. Under certain conditions, when the trade winds are blowing, squalls will be alternately from the head of the bay and from the northeast. This causes an anchored vessel to swing considerably, and it usually will be found advantageous to shift anchorage to the bay west of Puupehe Rock, where the squalls are not so pronounced.

Puupehe Rock, 0.5 mile southwest of Manele Bay, is 110 feet high, brown on its steep sides, and flat and grass-covered on its top. It is separated from the shore by a short, low sandspit. The rock is the most prominent landmark along this section of the coast. Rocks, over which the sea usually breaks, extend 300 yards eastward and southward from Puupehe Rock. The bay just to the west of the rock has a sandy beach at its head. Anchorage can be found about 400 yards from the head of the bay in depths of 8 fathoms, sandy bottom.

From Manele Bay to Palaoa Point, the coast consists of low bluffs, behind which the land rises in steep slopes to the tableland above. It is reported that the currents are weak along the south coast of Lanai. A high, detached, grass-covered rock is close to the shore 1.8 miles west of Puupehe Rock. Many small rocks are close to the shore; one, awash at times, is 400 yards offshore and about 2 miles east of Palaoa Point. No buildings can be seen along this coast.

Palaoa Point Light (20°44.1′ N., 156°58.0′ W.), 91 feet above the water, is shown from a white skeleton tower on the easterly prong of a double point at the southwestern extremity of Lanai Island. A small bight, with a rocky shore on which small boats can usually land during trade-wind weather, is between the double points. A small black rock, about 5 feet high, is about 200 yards off the northerly side of the point. Another rock, about the same distance offshore but 0.3 mile northward, is about 28 feet high.

Beyond Palaoa Point, the coast has a north-northwesterly trend. Between the point and Kaumalapau Harbor, the sheer coastal bluffs of **Pali Kaholo** are more than 1,000 feet high in some places. The bluffs are marked by two landslides; one, very large and conspicuous, is 1.5

miles northward of Palaoa Point; the other, not so large, is 2.5 miles northward of the cape.

Puu Ulaula, 1,262 feet high, is 2 miles northward of Palaoa Point and a mile inland from Pali Kaholo. There is an air-navigation installation on the summit.

Chart 4122.—Kaumalapau Harbor, 3.5 miles northward of Palaoa Point, is the best harbor on Lanai in all but westerly and kona weather. The harbor is a small bight at the mouth of the most prominent gulch in the vicinity. Kaumalapau is a commercial barge landing on the north side of the harbor.

Kaumalapau Light (27°47.2′ N., 156°59.7′ W.), 66 feet above the water, is shown from a 13-foot white house on the south side of the harbor entrance. Oil tanks are prominent on the high ground back of the wharf.

A 250-foot breakwater on the north side of the harbor entrance has a light on its outer end. There is no entrance channel but a 600-foot opening leads to a turning basin which is 30 to 50 feet deep and about 500 feet by 800 feet. The private wharf provides cargo sheds and about 400 feet of berthing space. Private facilities also include bulk-handling and storage for petroleum products.

Gasoline, diesel fuel, and fresh water can be obtained on the Kaumalapau wharf. Small craft up to 40 feet in length can be hoisted by derrick to the deck of the wharf and small machine repairs can be made at a nearby shop. See Appendix for **storm warning displays.**

Chart 4120.—Between Kaumalapau Harbor and Kaena Point, the coast is a series of bluffs, in some places precipitous and 300 to 400 feet high. The shore is rocky, with a few short stretches of sand. In general, the bottom is fairly steep-to, but small vessels can find anchorage with sufficient swinging room in some places. At times, when the trades are blowing, the wind sweeps down the gulches in heavy gusts which are felt for a mile or more offshore. There are no houses or trees of any size along this coast, and it has a barren appearance.

Five Needles, about 2.3 miles northward of Kaumalapau Harbor and near the middle of the westerly side of the island, are a group of detached pinnacle rocks. The outermost rock is about 300 yards offshore and 32 feet high, and the inner pinnacle is 120 feet high. The rocks are of the same material as the higher cliffs of the shore and are therefore not easily recognized from offshore.

Keanapapa Point, 7.5 miles northwest of Kaumalapau Harbor, is the westernmost point of Lanai. The point is low and rocky and is marked by a small knoll 150 yards inland from the shore. A small detached rock, 8 feet high and 150 yards offshore, is 1.9 miles southeastward of Keanapapa Point. The cliffs, which are 200 feet high in the vicinity of this rock, gradually diminish in height until they are only 20 or 30 feet high 0.5 mile southward of Keanapapa Point.

Kaena Point, 1 mile north of Keanapapa Point, is low and rocky and is hard to distinguish from the other points in the vicinity. The low, rounding, unlighted, northwest coast of Lanai is not easily seen at night and vessels should give it a berth of at least 1 mile, although 0.5 mile will clear all dangers. There are many small, rocky points and short, sandy indentations in this vicinity, and boats can land in the lee of the points at times.

Two miles northeast of Kaena Point is a mile-long stretch of sand beach, with no fringing reef, that provides easy landing for small boats. Eastward of this beach the coral reef fringes the northern and eastern sides of Lanai to a width of as much as 0.3 mile. In general, the beach is backed by a low, narrow strip of land which rises gently to the tableland. Vegetation consists of cactus, low brush, and a few small trees.

Chart 4130.—Pohakuloa Point, 4 miles east-northeastward of Kaena Point, is so low and rounding that it is difficult to recognize as the northern extremity of Lanai. A 150-yard opening in the reef 0.4 mile east of the point affords small-boat access to the sand beach. A lighted buoy is moored in 17 fathoms 5 miles east of Pohakuloa Point and 0.8 mile offshore.

Maunalei Gulch, 6 miles eastward of Pohakuloa Point, is forked and should not be confused with deep **Hauola Gulch,** 2 miles farther to the southeastward. A hard-surface highway leads from Lanai City to the mouth of Maunalei Gulch; a group of beach houses (probably **Kahokunui**) is 0.8 mile northwest of the gulch.

Keomuku, 10 miles southeastward of Pohakuloa Point, has a few houses and a church, none of which are prominent from offshore. There is a shallow opening in the reef off the village, and boats of less than 4-foot draft find anchorage behind and south of the entrance.

The northeast coast of Lanai should be given a berth of at least 0.8 mile. Current information for this coast is included in discussion of Auau Channel.

Kalohi Channel, 8 miles wide between Lanai and Molokai, is free of dangers except for the marginal reefs around the two islands.

Currents.—Observations made in Kalohi Channel in 1961 show reversing currents with average maximum velocities of 0.5 knot. The flood sets eastward and the ebb sets westward. See Tidal Current Tables for daily predictions.

MOLOKAI ISLAND (Chart 4116), 7.5 miles northwestward across Pailolo Channel from Maui and 8 miles northward across Kalohi Channel from Lanai, has an area of 259 square statute miles and ranks fifth in size of the eight major islands. More or less rectangular in shape, Molokai is about 34 miles long in a westerly direction and about 7 miles wide. The easterly end is mountainous, its summit being **Kamakou,** 4,970 feet high. On the northerly side, the mountain slopes are very steep, in many places almost perpendicular, and numerous deep gorges with precipitous sides can be seen. On the southerly side, the slopes are gradual, are cut by gorges, and terminate in a narrow strip of rolling land near the coast. On the westerly side, the land slopes gently and is cut by gulches; here and there an extinct crater can be seen. About 10 miles from the westerly end of the island the plain is only a few hundred feet high and is marked here

and there by prominent blowholes. The entire westerly end of the island is a bare tableland cut by small gulches and rising gradually to **Mauna Loa,** 1,400 feet high. From seaward this part of the island presents a smooth and rolling appearance.

The island does not have sufficient water for economic raising of sugarcane. The principal products are pineapples and cattle.

Anchorage.—Depths along the south and west coasts of Molokai are such that vessels may anchor at will, having due regard for the abrupt shoaling inside the 10-fathom curve. The bottom is mostly coral and sand. The east end of the island is exposed to the northeast trades and the north coast is unsurveyed. The only traffic along the north coast is an occasional vessel bound for Kalaupapa.

Currents.—Current observations have been made at several places along the southern shore of Molokai between Kamalo and Laau Point. They indicate, in general, an eastward flow along the shore in the vicinities of Kaunakakai and Kamalo and a westward flow near Laau Point. Combined with these movements are tidal currents which usually reach an eastward maximum velocity about the time of low water at Honolulu and a westward maximum about the time of high water. The westward flow near Laau Point is reported to turn sharply northward at the point and vessels should guard against a set toward the point. Currents are said to set westward along the entire northern coast of Molokai and northeastward along the east coast. For further current information covering waters adjacent to Molokai, see the discussions of Pailolo, Kalohi, and Kaiwi Channels.

Weather.—The trade winds divide at Cape Halawa, part following the north shore and another part following the south shore. Because of the topography of the island the trade wind is frequently a little south of east along the south coast of Molokai. The wind is usually light in the early morning but blows with considerable strength in the middle of the day. During strong trades, dust clouds appear over the western end of the island. Very heavy rainfall is found on the northeast side of the island; the south and west sides have very little rainfall.

Supplies.—Practically no supplies other than food are available on Molokai.

Communications.—The island has radiotelephone communication with the other islands and with the mainland. Good roads extend from Kaunakakai, on the south coast, to Molokai Airport, in the west central part of the island, and to Kamalo, Kolo, and other small towns. Interisland air and barge service are available.

From Cape Halawa, the eastern part of the island, to Kamalo, a distance of about 12 miles, the coast has a general southwesterly trend; thence to Laau Point, a distance of about 25 miles, the trend is westerly. A reef about 1 mile wide fringes almost the entire coast, the widest part being in the bight about 13 miles eastward of Laau Point. During the day the limits of the reef can generally be determined by the breakers, but at night, vessels are cautioned to give this coast a good berth.

Chart 4130.—Cape Halawa, the eastern point of Molokai, is a brown cliff about 300 feet high. Breakers extend about 300 yards off the point and a rock, which bares at times, is 250 yards offshore. During a heavy easterly sea, it is apt to be quite choppy off this point and vessels should give the cape a berth of about 1.5 miles.

Koalii, 1 mile west of the cape, is a hill 794 feet high. In general, the coast between Cape Halawa and Kaunakakai Harbor is low, but rises, first gently, then rapidly, to high, rugged mountains which are cut by many gulches.

Mokuhooniki, a small, yellow, bare, rocky islet, 198 feet high and with almost perpendicular sides, is 0.9 mile offshore and 1.6 miles southward of Cape Halawa. **Kanaha Rock,** 95 feet high, is about 50 yards southwestward of Mokuhooniki. Midway between the rocks and Molokai are depths of about 15 fathoms.

Honouliwai, 3.5 miles southwestward of Cape Halawa, is a small indentation in the coast which offers small boats a little protection from the trades. It should be entered only with local knowledge. About 0.3 mile northeastward of Honouliwai is **Honoulimaloo,** a small bight in the coast. The coral reef trends farther offshore from Honouliwai southwestward.

Waialua, 4.6 miles southwestward of Cape Halawa, consists of a few houses at the mouth of a gulch.

Pauwalu Harbor, 5 miles southwestward of Cape Halawa, is a double opening in the reef. The western opening is about 200 yards wide and is usually marked by breakers on either side. Within the entrance is a small pocket with depths of about 2 fathoms, where a few local sampans find some shelter. A house and tank near the beach are partly hidden by trees. The reef extends 0.6 mile offshore and the 10-fathom curve is about 0.7 mile offshore.

About a mile southwestward of Pauwalu Harbor is another opening in the reef near **Kainalu.**

Chart 4121.—Pukoo Harbor, 7.4 miles southwestward of Cape Halawa, is a pocket in the reef some 500 yards long, and narrower at the entrance than inside. An 18-foot channel about 50 yards wide extends across the entrance bar. A depth of 12 feet can be carried over the bar for a clear width of 150 yards. The harbor is smooth during the trades, although the wind sweeps across it with full force. During kona storms, breakers extend across the bar. This anchorage is suitable only for small craft. The village of **Pukoo** consists of a few houses on the lowland near the beach in front of a steep-sided gorge which extends well back into the mountain. The reef at Pukoo extends 0.6 mile offshore.

Chart 4130.—There are many old fishponds in the vicinity of Pukoo and along the coast for 10 miles westward. About 1 mile westward of Pukoo is the village of **Kaluaaha,** where two church steeples may be seen above the trees.

Kalaeloa Harbor, 3.2 miles westward of Pukoo Harbor, is the largest and best protected harbor along the coast,

but its use is limited by the bar across the entrance, which is an unmarked opening in the reef.

Chart 4121.—Kamalo Harbor, 5 miles southwestward of Pukoo Harbor, is a pocket opening southward in the reef at the most southerly point on Molokai. The harbor, excluding the entrance, is about 150 yards wide, and extends more than 0.5 mile into the reef. The entrance, about 90 yards wide, has a bar with a general depth of 14 feet, although it is possible to carry 19 feet into the harbor through a channel with a least width of 30 yards. A lighted buoy is off the entrance. The coral reefs marking the limits of deep water within the harbor are easily seen by day. The village of **Kamalo** consists of a few houses at the mouth of a gulch back of the harbor.

Kamalo Harbor is the only one along Molokai's south coast that is considered safe during a kona storm. The harbor is used by small boats but seldom by larger vessels. The swell is not felt within the harbor. Current observations a mile off Kamalo show velocities of about 1 knot.

Chart 4120.—Puu Papai, 830 feet high, is 2 miles northwestward of Kamalo Harbor and 0.6 mile inland. Deep **Kamalo Gulch** is a mile east of the hill and 2.5 miles westward of the hill is **Kawela Gulch,** which extends well inland from the small village of **Kawela.**

From Kamalo Harbor the coast has a westerly trend and the reef extends as much as a mile from shore.

Chart 4121.—Kaunakakai Harbor, 9 miles westward of Kamalo Harbor and 16 miles from the western extremity of Molokai, is a commercial barge harbor in the reef off **Kaunakakai** (1960 pop. 740; P.O.). The harbor is open to the southward and has no breakwater. The turning basin is 23 feet deep and approximately 600 feet by 1,500 feet. Channel markers include lighted and unlighted buoys and a **034° lighted range.**

The State-owned wharf provides a cargo shed and 680 feet of berthing space. A 700-yard-long mole extends northeastward from wharf to shore. The mole protects small craft from the trade winds. Barges can lie at the wharf except during the two or three severe kona storms of the winter season; Kamalo Harbor offers better protection for small craft during the konas. Fresh water is piped to the wharf; gasoline and diesel fuel can be delivered by tank truck. Some groceries and marine hardware may be obtained in Kaunakakai. See Appendix for **storm warning displays.**

The coastal reef extends more than a mile from shore on both sides of the Kaunakakai entrance. Vessels can anchor temporarily in depths of about 15 fathoms off the entrance, but there is little shelter from the northeast trades or the konas.

Current observations a mile off Kaunakakai indicate an eastward set most of the time. Maximum velocities observed were 1 knot eastward and 0.5 knot westward. Eastward and westward maximums occur at about the times of low water and high water, respectively, at Honolulu.

Chart 4120.—For 3 miles westward from Kaunakakai the lowlands extend much farther inland than along any other section of the coast. The reef extends more than a mile from shore and is mostly covered 1 to 3 feet but has many coral heads that bare at low water. The country between Kaunakakai and Kolo is bare and rocky and is cut by numerous small gulches. The sandy beach is fringed with algaroba trees.

The aero light at Molokai Airport and the aero obstruction lights on the surrounding hills are visible off the western shores of the island.

Chart 4121.—Kolo Harbor, about 10 miles west of Kaunakakai, is a large pocket in the reef with a narrow entrance from southward. The unmarked channel and the harbor have depths of about 8 feet; the harbor is subject to shoaling. A moderately heavy swell causes heavy surf on the entrance bar, and the combination of surf and current often creates a hazardous condition. Kolo Harbor affords anchorage with limited swinging room, but the swell is felt even though its full force is broken by the outer reefs. The harbor is not recommended for strangers.

Chart 4120.—From Kolo Harbor westward to Laau Point, the coast is low and has a narrow sand beach, broken here and there by short stretches of rocky shore. The coral reef gradually becomes narrower until it disappears at Laau Point.

Haleolono Point, 13 miles west of Kaunakakai and 3.5 miles east of Laau Point, is a conspicuous brown bluff, 50 feet high, that extends 0.2 mile along the water's edge. The barge harbor at the point is protected by two breakwaters; the entrance channel is 12 feet deep and the 500-foot-square harbor basin is 18 feet deep. The harbor has a 260-foot wharf, and fixed moorings provide an additional 680 feet of berthing space. Private facilities are available for bulk-handling and storage of sand and cinders. Local knowledge is advisable for entering.

Waieli is a prominent, bare hill, 625 feet high, a mile northeast of Haleolono Point. The hill is being quarried.

Laau Point, the southwestern extremity of Molokai, is low and rocky; the 10-fathom curve is about 0.5 mile offshore. **Laau Point Light (21°06.2′ N., 157°18.5′ W.),** 151 feet above the water, is shown from a 19-foot white pyramidal skeleton tower on a bluff near the point. The prevailing current off Laau Point is northerly, and vessels are cautioned against a set onto the point.

Penguin Bank, an extensive shelf, makes out from the western end of Molokai in a general west-southwesterly direction for a distance of 28 miles from Laau Point. The bank is fairly flat and consists of sand and coral at depths of 21 to 30 fathoms. Along the northern, western, and southern edges, the bank drops off very abruptly into depths of more than 100 fathoms.

In the vicinity of Laau Point currents are strong and likely to be erratic. There is usually a westward current flowing along the west part of the south coast of Molokai which turns sharply to the north as it rounds the point.

691-231—63——17

A strong tide rip west and north of the point forms breakers when the wind is northerly. A northeast set over Penguin Bank joins the northerly current along the west coast of Molokai. This current is not felt in the deep water west of Penguin Bank but is apparent at the edge of the bank when passing inside the 100-fathom curve. There is no apparent connection between this current and the tides, and the trade winds appear to have little effect upon it, although it appears to be stronger or weaker according to whether there is a barometric depression north or south of the islands.

Between Laau Point and Ilio Point, a distance of about 8 miles, the west coast of Molokai is bare, low, and rolling, and cut up by a few small gulches. The beach is marked by low bluffs and short stretches of sand, back of which the land rises gently.

The **restricted area** for a Navy drill minefield is 4 miles southwest of Laau Point; **see 207.805, Chapter 2, for limits and regulations.**

Ilio Point, 8 miles from Laau Point, is the northwestern extremity of Molokai. Breakers have been observed about 0.3 mile off Ilio Point during heavy weather. A lighted Loran tower is near the outer end of the point, and a 293-foot hill is 0.8 mile inland.

The north coast of Molokai is mostly bold but deep-draft vessels should not stand close to the shore. There is no harbor or anchorage along this north coast that affords shelter in all winds. Kalaupapa is the only port of call for local vessels.

Mokio Point, 3 miles east of Ilio Point, is a low, rocky bluff with a detached rock just offshore.

Five miles eastward of Ilio Point is **Hauakea Pali,** a low cliff which extends inland at right angles to the beach. The seaward end resembles a large, white sandbank and is the most conspicuous landmark in the vicinity. The cliff is the westerly boundary of the low plain that extends across the island.

Eastward of Hauakea Pali the coastal bluffs gradually rise to precipitous cliffs which are 2,000 to 3,000 feet high in some places.

Makanalua Peninsula, 16 miles east of Ilio Point, is a low point of land that juts out 2 miles from the face of a high cliff. **Molokai Light (21°12.8′ N., 156°58.3′ W.),** 213 feet above the water, is shown from a 138-foot white octagonal pyramidal tower on the outer part of the peninsula. There is deep water close to the peninsula except for the marginal reef just northward of Kalaupapa.

Kalaupapa (P.O.), on the west side of Makanalua Peninsula, is the commercial barge harbor for the leper colony which occupies the peninsula. Special permit is required to land unless on State business. This open harbor has a small breakwater about 75 feet long. The State landing provides 56 feet of berthing space and has depths of 2 to 4 feet alongside. Access is good and no channel is needed to reach open water. A **109° range** is lighted when required. Anchorage can be found in depths of 12 fathoms 0.2 mile off the landing.

Chart 4130.—The country between Makanalua Peninsula and Cape Halawa has a very irregular and jagged appearance and is more or less covered with vegetation. The coastal cliffs are broken by headlands, bights, and deep gulches. There are no landing places other than the few debris piles in front of the cliffs and the few level spots in the mouths of the gulches.

Kalawao, on the southeast side of Makanalua Peninsula, is a part of the leper colony.

Mokapu Island, 360 feet high, is 3 miles southeastward of Molokai Light and 0.7 mile offshore. The island is the outermost of two; **Okala Island,** 370 feet high, is close to shore.

Pahu Point, 5 miles southeastward of Molokai Light, is a bold, pyramidal headland 1,022 feet high. The point is the seaward end of a sharp ridge that extends inland along the west side of a deep gulch. **Mokolea Rock,** over which the sea always breaks, is 0.6 mile northeast of the point.

Umilehi Point, a mile east of Pahu Point, is particularly conspicuous and appears to be a small crater with the entire seaward side blown out. **Mokohola Island,** 20 feet high, is a dark rock 0.3 mile off Umilehi Point.

The eastern half of Molokai's north coast is noted for its rugged scenery and high waterfalls. **Papalaua Falls,** 10 miles eaastward of Makanalua Peninsula and 5 miles westward of Cape Halawa, start from an elevation of about 2,000 feet at the head of a deep gulch and have a 500-foot drop in one place.

Halawa Bay lies between **Lamaloa Head,** an 837-foot cliff, and Cape Halawa, the eastern extremity of Molokai. The bay, which is about 1.5 miles coastwise by 0.7 mile inland, affords no shelter from the trades but indifferent anchorage can be found in depts of 5 fathoms about 0.3 mile from the head. The shores of the bay are mostly backed by high cliffs; there are two black rocks close to the south shore.

Halawa consists of a few houses at the mouth of a deep gulch on the southwest side of Halawa Bay. The gulch penetrates westward and a waterfall is visible a mile from the mouth. A triangular cliff, 300 feet high, is conspicuous about 0.5 mile east of Halawa.

Chart 4116.—Kaiwi Channel, between Molokai and Oahu, is about 22 miles wide and is clear of obstructions. A general northward drift is reported over Penguin Bank and in the vicinity of Laau Point; elsewhere in the channel the currents appear variable, depending mainly upon the direction and velocity of the wind. The trade winds which follow the north and south shores of Molokai draw across Kaiwi Channel toward Makapuu Point.

OAHU ISLAND (Chart 4110), 22 miles west-northwestward across Kaiwi Channel from Molokai, has an area of 602 square statute miles and is third largest of the eight major islands. Oahu measures 39 nautical miles southeast-northwest between Makapuu and Kaena Points and 26 miles south-north between Barbers and Kahuku Points. The island has two prominent mountain ranges and its skyline is rough and jagged.

Koolau Range parallels the northeasterly coast for

nearly its entire length. The part of the range between Makapuu Point and Kaneohe Bay has on its seaward side a sheer, rocky cliff, or pali, nearly 2,000 feet high in some places. Northwestward of Kaneohe Bay, the cliffs give way to steep, rugged slopes. From offshore, the northwesterly half of the range appears as a long ridge, sloping gradually downward, and ending in low bluffs near Kahuku Point. The crest of the ridge and about half the seaward slope are wooded; the lower part of the slope is grass-covered. The entire range has a very jagged appearance and is cut up on its inland side by deep gorges and valleys. The greatest elevation in Koolau Range is at **Puu Konahuanui,** 3,150 feet high and 5 miles back of Honolulu; the peak is on the east side of Nuuanu Valley and overlooks the famous **Nuuanu Pali** at the head of the valley. Two miles closer to Honolulu is **Tantalus,** a rounded peak, 2,013 feet high, with a heavily wooded summit. On the seaward side of Koolau Range the land is most ly low and rolling; it is cut by a few sharp hills, and is under cultivation.

Waianae Mountains parallel the southwesterly coast for nearly the entire distance between Kaena and Barbers Points. Several spurs extending from the range toward the shore form short valleys. The range has numerous high peaks; **Kaala,** 4,046 feet high, is the highest.

Between the two mountain ranges is an extensive plain which extends from Pearl Harbor on the south to Haleiwa on the north; the plain rises to an elevation of about 1,000 feet at Wahiawa. There are low, flat, coastal plains between Honolulu and Barbers Point, in the vicinity of Waianae, Haleiwa, and Kahuku Point, and between Kaneohe Bay and Waimanalo. The greater part of these plains is under cultivation, principally in sugarcane.

Prominent headlands on Oahu are Makapuu Point, Koko Head, Diamond Head, Kaena Point, Kahuku Point, Kualoa Point, and Mokapu Peninsula. The entire coast of the island is fringed with coral reefs 0.5 to 1 mile in width, except along parts of the west shore between Barbers Point and Kaena Point. From Kaena Point to Kahuku Point, the reefs are not so continuous as along other parts of the island.

Harbors and ports.—The largest harbors on Oahu are Kaneohe Bay and Pearl Harbor, both of which are prohibited areas. Honolulu is the only commercial deepwater harbor on the island. Small-craft harbors include Maunalua Bay, Honolulu's Ala Wai Boat Harbor and Kewalo Basin, Pokai Bay, and Waialua Bay; the northeast coast is exposed to the trade winds during most of the year and the only small-craft shelter available is in Kaneohe Bay which may be entered only with Navy permission.

Currents.—The currents around Oahu depend largely upon the winds and are variable in velocity and direction. The general tendency is a westward or nothward flow along the coast. Tidal currents and eddies are noticeable in some places.

Weather.—Thanks largely to the marked marine influence and the persistent trade winds, the climate of Oahu is unusually pleasant for the tropics. Records for downtown Honolulu, on the leeward side of the island, show a lowest temperature of 57° F. and a highest of 88° F. In some parts of the Koolau Range the annual rainfall is as much as 300 inches; at Honolulu the average is 24 inches. The driest region is the southwest coast where rainfall drops to below 20 inches a year. See Appendix for **storm warning displays.**

Supplies and repairs.—All kinds of supplies are available at Honolulu, and medium-size vessels can be hauled out for repairs.

Communications.—Oahu has a good network of hard-surfaced highways. Air and sea transportation is available from Honolulu to the other islands and to the mainland.

Chart 4131.—Makapuu Head, the eastern extremity of Oahu, is a bold, barren, rocky headland 647 feet high. **Makapuu Point Light (21°18.8′ N., 157°39.1′ W.),** 420 feet above the water, is shown from a 46-foot white cylindrical concrete tower on the head; a radiobeacon is 670 feet southwest of the light. See Appendix for **storm warning displays.**

The seaward side of Makapuu Head is a dark cliff; the inland side slopes rapidly to the valley which separates it from the Koolau Range. The headland is the landfall for vessls inbound to Honolulu from the mainland.

There is deep water close to the outer end of the headland but shallower water is found along the north and east sides. Deep-draft vessels should give Makapuu Head a berth of about a mile and/or stay in depths greater than 20 fathoms.

Koko Crater, 2.6 miles southwest of Makapuu Head and 0.5 mile from the beach, is a sharp, brown cone 1,204 feet high. The coast between Makapuu Head and Koko Crater is low sand, rock, and shingle; from Koko Crater to Koko Head the coast is rocky, precipitous, and somewhat irregular.

Hanauma Bay, 3.5 miles southwest of Makapuu Head, is 0.3 mile wide and extends 0.5 mile inland. The waters off the entrance are very choppy during easterly winds but the bay does afford some shelter for small craft. Across the head of the bay is a sand beach which is fringed by 150 yards of coral reef. Back of the beach is a steep bluff up which is a short trail that leads to the highway. The bay is a popular picnic and bathing resort.

Koko Head, 4 miles southwest of Makapuu Head, is a bold promontory 640 feet high; the seaward side is precipitous, the top is flat, and it slopes off rapidly on the inland side. The headland is partly wooded on its lower western slopes but its general appearance is mostly brown and barren. There is deep water close to Koko Head. Strong westward currents have been reported offshore.

Maunalua Bay is an open bight that extends westward from Koko Head to Diamond Head; coral reefs fringe most of the shore. Dredged channels with depths of at least 5 feet lead through the reefs to private developments on the west side of Koko Head; private markers include buoys and daybeacons. Behind the Koko Head reefs is one of the few anchorages that offer small-craft shelter in all weather except kona storms; depths are 13

feet. Tidal currents in Maunalua Bay flood westward and ebb eastward; slack waters occur at about the times of high and low waters at Honolulu.

Wailupe, 2.7 miles westward of Koko Head, is a residential area with a seawall and private piers. A channel, reported dredged to 12 feet, leads through the reefs to Wailupe.

Diamond Head, 9 miles west-southwest of Makapuu Head, is an extinct crater 761 feet high. The steep slopes and the top of the crater are bare and brown; the base is brush-covered. **Diamond Head Light (21°15.5′ N., 157°48.7′ W.),** 147 feet above the water, is shown from a 55-foot white pyramidal concrete tower near the beach; see Light List for **special direction-finder calibration service.** A lighted buoy is moored in 90 feet of water 0.6 mile off the light. Currents setting in various directions with velocities up to 1 knot were noted about 3 miles southwest of Diamond Head.

Chart 4132.—The low coast between Diamond Head and Honolulu Harbor is thickly developed and palm trees are numerous. Along this stretch is world-famous **Waikiki Beach** with its big hotels, its natatorium, its surfboarding, and its outrigger canoe races.

Ala Wai Boat Harbor is 2.7 miles northwest of Diamond Head Light. The dredged entrance channel through the reef had a controlling depth of 17 feet in May, 1963. Depths inside the harbor are 5 to 17 feet. Markers include lighted and unlighted buoys, daybeacons, and a **014° lighted range.** An assistant harbormaster controls berthing and mooring facilities in the harbor.

Kewalo Basin, 3.5 miles northwest of Diamond Head Light, is used mostly by fishing craft. The dredged entrance channel through the reef has a controlling depth of about 19 feet. Depths in the basin are 4 to 22 feet. Markers include lighted and unlighted buoys and a **035° lighted range.** On the northwest side of the basin are a cannery and a shipyard; the marine railway at the yard can haul out vessels up to 75 feet in length. An assistant harbormaster controls basin facilities.

Charts 4109, 4132.—Honolulu Harbor is 5 miles northwest of Diamond Head and midway along the south coast of Oahu; the harbor is protected from all winds and is usually free of surge. **Honolulu** (1960 pop. 294,194; P.O.) is the capital and the principal deepwater port of Hawaii State.

Prominent features.—Sand Island, which borders the seaward side of Honolulu Harbor, is Government-owned and has been built up mostly from harbor dredging.

Honolulu Harbor Light (21°18.6′ N., 157°52.1′ W.), 198 feet above the water, is shown from 193-foot **Aloha Tower** on Pier 10; the cream square clock tower is one of the most conspicuous objects in the city. Another distinctive mark is the pineapple-shaped tank 0.7 mile northwest of Aloha Tower; the tank has a top elevation of 199 feet. **Punchbowl Hill,** 500 feet high and flat-topped, is a mile inland from Aloha Tower.

Tantalus Light (21°19.7′ N., 157°49.2′ W.), 1,346 feet above the water, is shown from a private residence on the south slope of Tantalus 3 miles east-northeastward of Aloha Tower. The fixed green light, privately maintained, is visible 25 miles.

Boundary lines of inland waters.—A specific line has been established for **Mamala Bay,** which includes Honolulu Harbor; **see 82.175, Chapter 2.**

Channels.—A Federal project provides for a 40-foot **Honolulu Entrance Channel** and for depths of 35 feet in the harbor basins; channel markers include lighted and unlighted buoys, lights, and a **028° lighted range.**

Project also provides for a 35-foot **Kalihi Channel,** 1.5 miles westward across Sand Island from Entrance Channel, to the 35-foot basins; channel markers include lighted and unlighted buoys, lights, and a **007° lighted range.** The Sand Island highway bridge over the harbor end of Kalihi Channel has a bascule span with a clearance of 15 feet; **see 203.900, Chapter 2, for drawspan regulations.**

Anchorages.—Recommended anchorage, except during strong kona winds, is in depths of 12 fathoms, sand and coral bottom, in Mamala Bay between the seaward ends of the two deepwater channels. Anchorage is not practical in the harbor basins because of the limited swinging room. An **explosives anchorage area** has been established 1.3 miles west of the entrance to Kalihi Channel; **see 202.235, Chapter 2, for limits and regulations.**

Caution.—Vessels approaching the harbor from the west at night should not mistake the lights between Pearl Harbor and Honolulu for the lights of Honolulu, or the lighted buoys off Kalihi Channel for the lighted buoys off the main entrance. Vessels have mistaken these lights and gone aground off Keehi Lagoon. From the eastward the lights north of Diamond Head should not be confused with those of Honolulu, or the lighted aids of Kewalo Basin with those of Honolulu Harbor.

Tides.—The diurnal range of tide is 1.9 feet at Honolulu. Daily predictions for Honolulu are given in the Tide Tables.

Currents.—It is reported that a tidal current floods westward and ebbs eastward along the coast between Makapuu Point and Honolulu. In the vicinity of Honolulu an eastward counterflow along the edge of the reef is reported to accompany the westward flood. Strong westward currents have been reported off Honolulu. Currents setting toward all four quadrants and having velocities up to 1 knot have been noted about 3 miles southwest of Diamond Head.

Seismic sea wave warning displays.—International Code flags OXM (tidal wave) will be displayed, daytime only, at Aloha Tower, Ala Wai Boat Harbor, and Kewalo Basin, all in Honolulu. See discussions of seismic sea waves at beginning of this chapter and in Chapter 1.

Weather.—See Appendix for **Honolulu climatological table** and **storm warning displays.**

Pilotage.—This is compulsory for all foreign vessels and for United States vessels under register in the foreign trade; it is optional for United States vessels in the coastwise trade. State pilots of the Harbors Division may be obtained by flag hoist, by radio to harbormaster, or in emergency by signalling the Pearl Harbor control

tower, call Letters H–1. Vessels are boarded a mile off the entrance channel.

Towage.—Tugboats are available in Honolulu for any requirement. Salvage equipment also is available.

Quarantine.—Officials board vessels at the piers or off the entrance buoys. The quarantine station is at **Fort Armstrong** on the east side of Honolulu Entrance Channel.

The U.S. Public Health Service maintains an outpatient clinic in Honolulu and has contract space in several hospitals, one of which is the Army's Tripler General Hospital. Medical advice for ships at sea is available by commercial or government radio.

Customs and Immigration.—Honolulu is the headquarters of a customs district and is a customs port of entry at which marine documents are issued. The Immigration Service maintains offices in the city.

Harbor regulations.—Regulations are established by the Harbors Division, Hawaii Department of Transportation, and are enforced by the harbormaster. **Traffic control** in Honolulu is controlled by means of orange ball and orange cone signals on the yardarm on Aloha Tower by day and by amber lights on the tower at night. The lower light, showing fixed, is 143 feet above the water; the upper light, showing quick flashing, is 153 feet above the water. The lights are visible 5 miles from 320° to 062°. Traffic signals are: by day, ball hoisted at yardarm, incoming traffic only; cone hoisted at yardarm, outgoing traffic only; ball and cone hoisted at yardarm, harbor closed to all traffic; by night, flashing light on, incoming traffic only; fixed light on, outgoing traffic only; both lights on, harbor closed to all traffic. When no day or night signals are shown the harbor is closed for traffic of vessels over 500 gross tons. It is the invariable custon to display the ball on the eastern, or Waikiki, side of the yardarm and the cone on the western, or Ewa, side of the yardarm. To pass visual messages, contact Pearl Harbor Signal Tower, call H–1.

The **speed limit** in Honolulu Harbor is 5 knots for all vessels and tows and 10 knots for sampans, motorboats, and other small craft.

Wharves.—Honolulu Harbor has ample berthing space for deep-draft vessels. Federal, State, and private transit sheds provide nearly two million square feet of storage space. State-owned pipelines are available for petroleum products. Private facilities include bulk-handling equipment and storage area for sugar, molasses, cement, grain, feeds, liquid fertilizer, and petroleum products. Offloading equipment is provided for sand, aggregate, and cinders. Floating and mobile cranes have lifting capacities of 60 to 90 tons. The principal small-craft facilities are in Ala Wai Boat Harbor, Kewalo Basin, and Keehi Lagoon.

Supplies.—Bunker oil, gasoline, diesel fuel, provisions, and ship chandlery are available in quantity. Fresh water is piped to most of the piers.

Repairs.—Honolulu has a floating drydock with a deadweight capacity of 3,500 tons. The port area also has two marine railways that can handle vessels up to 75 feet in length. In emergency, large commercial vessels have been hauled out at Pearl Harbor Naval Shipyard.

Communications.—Honolulu is a major port of call for transpacific vessels, and there is commercial barge service to and from the other islands. Air service, passenger and freight, includes scheduled flights to the other islands, to the mainland, and to western and southwestern Pacific areas.

Chart 4132.—Keehi Lagoon, 6 miles northwest of Diamond Head, is triangular in shape and is fronted by coral reefs. Three intersecting channels, which form seaplane landing areas, have been dredged in the lagoon to depths of 10 feet. Kalihi Channel, previously mentioned, cuts through the southeastern part of the lagoon. A 20-foot channel branches northwestward from Kalihi Channel to a small-boat harbor and a barge harbor on the east side of the landing areas; the barge channel is marked by a 334° lighted range.

Honolulu International Airport, on the north shore of Keehi Lagoon, is the largest commercial airport in the State. The aero light on the administration building is prominent from seaward.

Chart 4110.—A low, flat plain, 3 to 5 miles wide, borders the sandy shore between Keehi Lagoon and Barbers Point. The area includes Pearl Harbor and several airfields. West of Pearl Harbor, much of the area is tree-covered or planted in sugarcane.

Pearl Harbor, 9.5 miles west-northwest of Diamond Head, is a **defensive sea area.** The establishing executive order of May 26, 1939, says in part:

(*a*) The area of water in Pearl Harbor, Island of Oahu, Territory of Hawaii, lying between extreme high-water mark and the sea, and in and about the entrance channel to said harbor, within an area bounded by the extreme high-water mark, a line bearing south from the southwestern corner of the Puuloa Naval Reservation, a line bearing south from Ahua Point, and a line bearing west from a point 3 miles due south from Ahua Point, has been established as a defensive sea area for purposes of national defense, and no persons (other than persons on public vessels of the United States) are permitted to enter this defensive sea area, and no vessels or other craft (other than public vessels of the United States) are permitted to navigate in this area, except by authority of the Secretary of the Navy.

(*b*) For the purpose of acting on requests of vessels registered, enrolled, or licensed under the laws of the United States, whose normal legitimate business requires entry into Pearl Harbor, the Commandant, 14th Naval District, is designated as the representative of the Secretary of the Navy, with authority to act on such requests.

(*c*) The Commandant, Naval Shipyard, Pearl Harbor, is responsible for prescribing and enforcing such rules and regulations as may be necessary for insuring security and for governing the navigation, movements, and anchorage of vessels in the waters of Pearl Harbor and in the entrance channel thereto.

General description.—There are many prominent features in and around Pearl Harbor; see chart. The fan-shaped harbor has an entrance width of 400 yards and a greatest inland extend of 5 miles. The 45-foot entrance

channel is marked by lighted and unlighted buoys and by a lighted range. The main basin is divided by two peninsulas and an island into four smaller basins known as **West Loch, Middle Loch, East Loch,** and **Southeast Loch.** Tidal currents are generally weak but the ebb sometimes exceeds 0.5 knot.

Chart 4133.—Barbers Point, 17 miles westward of Diamond Head, is the southwestern extremity of Oahu. The low land back of the rounding point extends 3 miles northward to the foothills of the Waianae Mountains; the hill slopes are steep and partly brush-covered but the bare soil that shows in places gives them a reddish appearance.

Five miles northeastward of Barbers Point and 2 miles inland are the prominent chimneys of a sugar mill at **Ewa.** A stack and several silos are close northwestward of Barbers Point Light, and an aero light is 2 miles east-northeastward of the point.

Barbers Point Light (21°18.0′ N., 158°06.5′ W.), 86 feet above the water, is shown from a 72-foot white cylindrical concrete tower. A reef extends 0.6 mile off the light; a lighted buoy is moored in 48 feet off the south side of the reef.

A **253°22′–073°22′ measured nautical mile** has been established 2.5 miles east of Barbers Point. The front markers are white triangles, with horizontal orange band, on 55-foot posts; the rear markers are white triangles, with vertical orange band, on 70-foot posts.

An **anchorage for tank vessels** has been established 2 miles southeastward of Barbers Point; **see 202.236, Chapter 2, for limits and regulations.**

Currents.—There is a general westward current along the coast between Honolulu and Barbers Point. Velocities up to 0.8 knot, setting westward, have been measured off the point and greater velocities have been reported.

Chart 4110.—The coast has a general northwesterly trend between Barbers Point and Kaena Point, a distance of about 20 miles, and consists of alternating ledges of rock and stretches of white sand. Spurs of the Waianae Mountains extend to most of the points. Between the spurs and ridges are heavily wooded valleys which contrast with the rocky and bare mountains. A highway follows the coast from just north of Barbers Point to Kaena Point.

Much of the shoreline is fringed with rocks and reefs, but they are mostly close to the shore. The 3-fathom curve is within 0.5 mile of the shore and the 10-fathom curve is within 1 mile. Vessels can avoid all outlying dangers by giving the coast a berth of 1 to 1.5 miles. There are no harbors or anchorages along the west coast that afford shelter in all winds. During easterly weather small craft anchor 0.5 mile offshore in Pokai Bay.

A private barge harbor is about 2 miles northwestward of Barbers Point. The entrance channel through the reefs and the basin have been dredged to 21 feet. Privately maintained markers include an unlighted range and daybeacons.

Kahe Point, 3.5 miles northward of Barbers Point, is the seaward end of a mountain spur. A large power plant is located on the point. Three short boulder groins extending from the shore protect the intake of the plant's cooling system.

Nanakuli (1960 pop. 2,745; P.O.), 5.5 miles northward of Barbers Point, is a homestead area near the shore.

Puu o Hulu, about 7 miles northwestward of Barbers Point, is a narrow rocky, barren ridge, 1.5 miles long. A large water tank is on the saddle of the ridge. The ridge is on **Maili Point,** the southerly of the two important projecting points of this coast, and is the most conspicuous landmark in this vicinity. The westerly end of the ridge is close to the shore, has an elevation of 586 feet, and is precipitous on its seaward side.

Chart 4136.—Lualualei Homestead tracts (1960 pop. 5,045) are north and northeast of Puu o Hulu. Radio towers are prominent in the valley. **Puu Mailiilii,** about 2 miles northward of Puu o Hulu, is a narrow, rocky ridge, 723 feet high, near the shore and approximately at right angles with it.

Low **Kaneilio Point,** 10 miles northwestward of Barbers Point, projects 0.2 mile from the general coastline. An **artificial fishing reef** consisting of old auto bodies is a mile south of the point. Between Puu o Hulu and Kaneilio Point the light-colored buildings of a limekiln 0.3 mile inland show up against a dark background.

Pokai Bay, on the northwest side of Kaneilio Point, is the seaward approach to **Waianae** (1960 pop. 6,844; P.O.). Shallow water extends 0.3 mile from the inner shore of the bay. The Kaneilio Point breakwater and the opposing boulder groin from the inner shore combine to provide small-craft shelter in depths of 1½ to 2 fathoms.

Local magnetic disturbance.—Differences of 2° or more from normal variation may be expected in Pokai Bay.

A deep valley extends about 4 miles inland between Puu o Hulu and Lahilahi Point and is the largest valley on this side of the Waianae Range. The broken ridge which makes down to Puu Paheehee divides the valley. **Puu Paheehee,** 652 feet high, is about 1 mile inland from Waianae.

Lahilahi Point, 1.7 miles northwest of Kaneilio Point, is a detached, steep ridge of dark rock, 234 feet high. This narrow, conspicuous point, projecting seaward about 0.2 mile, has the appearance of an islet from a distance.

Kepuhi Point, 13 miles northwest of Barbers Point, is a few hundred yards from the seaward end of a bold, rocky, mountain spur.

Chart 4110.—The coastal bight between Kepuhi Point and Kaena Point, 7 miles to the northwestward, is backed mostly by ridges of the Waianae Mountains. Midway along the bight is a sand beach in front of a small valley; small boats can make beach landings when the sea is smooth and can anchor in depts of 4 to 6 fathoms about 0.2 mile offshore.

Kaena Point, the northwestern extremity of Oahu, is low and rocky and is only a few hundred yards from the foot of Kuaokala Ridge. **Kaena Point Light (21°34.7′ N., 158°16.9′ W.),** 65 feet above the water, is shown from a 20-foot white pyramidal concrete tower. Off the end of

the point are several low, jagged rocks, over which the sea washes, and breakers extend about 0.4 mile from shore. The 10-fathom curve is 0.8 mile west of the point.

The **danger zone** of a firing area covers a wide sector north of Kaena Point; **see 204.224, Chapter 2, for limits and regulations.**

Currents.—A continuous northwestward current and moderate tide rips are reported off Kaena Point. Observations over a 24-hour period at a location 0.8 mile southward of Kaena Point Light show a northwestward current averaging 0.8 knot; the greatest velocity measured was 1 knot.

The north coast of Oahu trends eastward for 9 miles from Kaena Point to Waialua, thence northeastward for another 11 miles to Kahuku Point; rock ledges alternate with stretches of white sand beach. The broad valley back of Waialua spreads to a coastal plain which narrows as it approaches Kaena and Kahuku Points; most of the valley is cultivated in sugarcane. From Kaena Point to Waialua the mountains have a rugged appearance; from Waialua to Kahuku Point the hills resemble a continuous plateau. A hard-surface highway parallels the coast.

Most of the north coast is fringed with reefs as much as 0.5 mile in width, but all dangers can be avoided by staying at least a mile from shore. There are no all-weather harbors along this coast, even for small craft.

Kuaokala Ridge, back of Kaena Point, is high and its seaward end breaks off rather abruptly. The scattered beach houses between Kaena Point and Waialua are backed by cultivated fields which extend to the mountains.

Kaiaka Bay is a small coastal dent 9 miles east of Kaena Point; **Kiikii Stream** and **Paukauila Stream** empty into the head of the bay. Prominent from offshore is the mill stack in **Waialua** (1960 pop. 2,689; P.O.), a half mile back of the beach. A depth of 3 feet can be carried halfway into the bay by passing between the **Kaiaka Point** reefs, on the northeast side, and the reef in midentrance.

Waialua Bay, a mile northeast of Kaiaka Bay, is a small dent at the bend in the middle of the north coast. The bay shores are low, black rock, with sand patches in the bights and fringed by large algaroba trees. The low land back of the beach slopes gently to a tableland with mountain ranges on either side. **Haleiwa** (1960 pop. 2,504; P.O.) is at the head of Waialua Bay.

Anahulu River empties into the southwest corner of Waialua Bay. The channel into the bay has a controlling depth of about 6 feet to the moorings at the mouth of the river; markers include lighted and unlighted buoys and a **129° lighted range.** The moorings are along a jetty and seawall and are protected from all but heavy northerly or northwesterly weather. River navigation is restricted by the fixed bridge over the mouth; the clearance is 8 feet for a channel width of 14 feet.

The narrow coastal plain between Waialua and Kahuku Point is backed by a vegetation-covered tableland with steep seaward slopes which are cut by deep gorges.

Waimea Bay, 5 miles northeast of Waialua, is a small coastal dent at the mouth of the **Waimea River** gorge. The highway bridge over the river can be seen from seaward. Scattered buildings are visible on the north side of the bay.

Wananapaoa Islet, the outer of two ragged masses of black rock off the south point of Waimea Bay, has deep water close to its seaward sides. The submerged rocks near the point on the northeast side of the bay are usually marked by breakers. The rock crushers on the northeast point are conspicuous.

Waimea Bay affords little shelter, and beach landings can be made only in very smooth weather. There is a wide beach at the head of the bay, but both sides of the entrance are fringed with rocky ledges. Indifferent anchorage is available in depths of 9 or 10 fathoms, sand bottom, 0.3 mile west of the river mouth.

Waialee is 4 miles northeast of Waimea Bay. A group of large conspicuous buildings is at the foot of a bluff a few hundred yards inland.

Kahuku Point, the northern extremity of Oahu, is low and sandy; the dunes are partly overgrown with vegetation and there are a few scattered trees. The coast rounds gradually at Kahuku Point and there are several small black rocks close to shore. The land rises gently from the low bluffs near the point to the mountains of Koolau Range. The 10-fathom curve draws in to within 0.4 mile of the point. The breakers afford sufficient daytime warning of coastal dangers, but the low, unmarked point is difficult to locate at night. Currents off Kahuku Point set westward or northwestward but are sometimes negligible; tide rips have been reported a mile eastward of the point.

The **danger zone** of a low-level aerial radar target is centered 2.5 miles east of Kahuku Point; **see 204.223, Chapter 2, for limits and regulations.**

The coast between Kahuku Point and Makapuu Point, 30 miles to the southeastward, is known as **Windward Oahu** and is more productive than other parts of the island because of its greater rainfall. Paralleling this coast is the Koolau Range from which several spurs reach shore between Laie Bay and Kaneohe Bay. The shore is mostly low and sandy but with black rocks in some places, particularly at the headlands and most of the points. Between the shore and Koolau Range is a narrow strip of cultivated land; this coastal area widens between Kaneohe Bay and Waimanalo and is one of the principal agricultural areas of Oahu. There are good highways along the entire coast.

Nearly all of this northeast coast is fringed by coral reefs with little or no water over them at low tide, and the area is exposed throughout most of the year to the sea and swell built up by the northeast trades. The numerous small openings in the reefs can be navigated by local craft; wider openings lead to Kahana, Kaneohe, Kailua, and Waimanalo Bays. The 10-fathom curve is no farther than 1.6 miles from shore except in Kaneohe Bay.

Kahuku (1960 pop. 1,238; P.O.), 3 miles southeast of Kahuku Point, is marked by a mill stack which is a half mile from the beach. A prominent aero radiobeacon is a mile north of Kahuku.

Low **Makahoa Point** projects 0.2 mile from the general coast 3.5 miles southeast of Kahuku Point. **Kihewamoku Islet,** 24 feet high, is 0.5 mile off Makahoa Point; 0.2 mile

north of the islet is a rock that covers 4 feet and sometimes breaks.

Wooded **Kalanai Point,** 4 miles southeast of Kahuku Point, is on the north side of Laie Bay. **Mokuauia Island,** 0.2 mile long and 23 feet high, is 0.2 mile off the point; between the island and the point are depths of only 1 or 2 feet. A rock 0.2 mile seaward of the island is covered 10 feet.

Pulemoku Rock, 30 feet high, is 0.4 mile southeast of Mokuauia Island. A 2-foot-high rock is close to the southern side of Pulemoku.

Laie Bay has outer depths of 3 to 7 fathoms, and a narrow reef opening affords access to shelter and landing for local small craft. **Laie** (1960 pop. 1,767; P.O.), at the head of the bay, has a **Mormon Temple,** a large, flat-roofed building which is visible from seaward.

Laie Point, 5.5 miles southeast of Kahuku Point, is on the south side of Laie Bay; the low, narrow point has a rocky beach. Off the outer end of Laie Point are two small, flat, rock islets; **Kukuihoolua Islet** is 30 feet high and **Mokualai Islet** is 33 feet high.

Puu Kaipapau, about 700 feet high, is 2 miles southward of Laie Point and a half mile inland; the hill has a pyramidal-shaped, grass-covered top.

Hauula (1960 pop. 806; P.O.) is a beach settlement 2.5 miles south of Laie Point.

Kahana Bay, 11 miles southeast of Kahuku Point, has an entrance width of a mile between **Makalii Point** on the north and **Mahie Point** on the southeast; inland extent is 0.6 mile. Local small craft make the narrow passage through the reef and find shelter behind it. The breakers on both sides of the bay are the only guides for entering.

Chart 4134.—Kualoa Point, 15 miles southeast of Kahuku Point, is on the northwest side of the entrance to Kaneohe Bay. **Mokolii Island,** 206 feet high, is a conspicuous conical islet 0.3 mile seaward of Kualoa Point.

Kaneohe Bay has an entrance width of 4.6 miles between Kualoa Point on the northwest and Mokapu Peninsula on the southeast; greatest inland extend is 3 miles. The bay has low sand and coral beaches along which are many of the old diked fishponds that are no longer used. Islands, coral reefs, and sand shoals are numerous throughout the bay; **Mokuoloe Island,** in the southeastern part of the bay, is largest of the islands.

Kaneohe (1960 pop. 14,414; P.O.), near the southeastern end of the bay, is the principal community in the area. Radio towers are prominent at **Heeia,** a mile northwest of Kaneohe. Glass-bottom boats for tourist excursions operate from a pier a mile northwest of Heeia Landing.

Kaneohe Bay is a defensive sea area. The establishing executive order of February 14, 1941, says in part:

The territorial waters within Kaneohe Bay between extreme high-water mark and the sea and in and about the entrance channel within a line extending 3 miles northeast from Kaoio Point, a line extending 4 miles northeast from Kapaho Point, and a line joining the seaward extremities of the two above-described bearing lines, are hereby established and reserved as a naval defensive sea area for purposes of national defense, such area to be known as Kaneohe Bay Naval Defensive Sea Area; and the airspace over the said territorial waters is hereby set apart and reserved as a naval airspace reservation for purposes of national defense, such reservation to be known as Kaneohe Bay Naval Airspace Reservation.

At no time shall any person, other than persons on public vessels of the United States, enter Kaneohe Bay Naval Defensive Sea Area, nor shall any vessel or other craft, other than public vessels of the United States, be navigated into said area unless authorized by the Secretary of the Navy.

At no time shall any aircraft, other than public aircraft of the United States, be navigated into Kaneohe Bay Naval Airspace Reservation, unless authorized by the Secretary of the Navy.

Note.—The Chief of Naval Operations has suspended Naval Control over entry into that portion of Kaneohe Bay Naval Defensive Sea area northwestward of a line drawn from Lae O Kealohi Point (21°26′47″ N., 157°48′39″ W.) to the easternmost point of Kapapa Island (21°28′47″ N., 157°47′58″ W.); thence to seaward on the bearing 45° to the present northeastern limit of the Naval Defensive Sea Area (21°31′39″ N., 157°44′57″ W. approx.). Naval Control over entry into the remainder of the Kaneohe Bay Naval Defensive Sea Area remains in full force and effect.

A permit to enter Kaneohe Bay may be obtained from the Commanding Officer, Kaneohe Naval Air Station. The bay is by far the best locality for the operation of small craft on Oahu. Many permits are being obtained by property owners to dredge small-boat basins and channels through the reefs. Numerous docks, including the Kaneohe Yacht Club dock, are located in the bay. A dredged channel marked by buoys leads into the northern end of the bay. See Appendix for **storm warning displays.**

Chart 4110.—Mokapu Peninsula, 20 miles southeast of Kahuku Point, has a greatest elevation of 683 feet. **Pyramid Rock,** on the northwest point of the peninsula, is black and has a sharp summit. **Pyramid Rock Light (21°27.9′ N., 157°46.0′ W.),** 101 feet above the water, is shown from a white square concrete house with black diagonal stripes; an aero light is a mile to the south-southeastward.

Ulupau Crater, part of an old crater rim, is a rocky headland at the northeast end of Mokapu Peninsula. **Mokumanu Islands,** two islets with vertical sides 202 feet and 132 feet high, are 0.7 mile northward of the headland. The passage between the islets and the peninsula has midchannel depths of 5 fathoms but is not recommended for strangers. An eastward current is reported in the vicinity of Mokumanu Islands.

The beach between Mokapu Peninsula and Makapuu Head, 10 miles to the southeast, is mostly low and sandy, with black rocks showing in some places. Between the beach and the cliffs of the Koolau Range is a narrow strip

of cultivated land. The cliffs are characteristic of Koolau Range from behind Kaneohe Bay to rugged Makapuu Head.

Mokolea Rock, 20 feet high, is a mile off the southeast side of Mokapu Peninsula; the small, black rock has depths of 5 to 8 fathoms around it.

Kailua Bay, south of Mokapu Peninsula, is an open bight which affords no shelter from the trades. The northern part of the bay is free of the usual fringing reefs, and there is a sand beach at the head of the bay.

Alala Point, on the south side of Kailua Bay, is a low bluff with a 25-foot white stone monument that resembles a lighthouse.

Mokulua Islands, 0.7 mile from shore and midway between Mokapu Peninsula and Makapuu Head, are steep, rocky, and grass-covered. Elevations are 206 feet for the northern islet and 182 feet for the southern islet. On the shore side of the islets is an extensive reef; between the reef and the shore is a small-boat passage that leads to private landings.

Chart 4131.—Wailea Point, 5 miles northwest of Makapuu Head, is the northwest point of Waimanalo Bay. An airfield occupies a large area south of the point.

Waimanalo Bay, between Wailea Point and Makapuu Head, affords all-weather shelter for small craft behind the barrier reefs which parallel much of the bay's shore. A 2-mile stretch off midbay has no fringing coral reef; in the southern part the reef gets closer to shore and disappears near Makapuu Head. Depths of 10 feet can be carried into the bay except during strong trades when the entrance is closed by breakers. **Waimanalo** (1960 pop. 3,011; P.O.) is on the coastal highway that skirts the head of the bay.

Manana Island, 361 feet high, is a mile north-northwest of Makapuu Point Light. The island is part of an old crater and has a lighter shade of rock than any other in the vicinity. The sides are bluff except on the west where there is a short sloping point. The water is deep on the seaward side of Manana Island, and there are depths of 4 fathoms between the island and the mainland; the 4-fathom passage is not recommended for strangers.

Kaohikaipu Island, 80 feet high, is a flat, black mass of rock midway between Manana Island and Makapuu Head. A double rock, 10 feet high, is 200 yards northeast of Kaohikaipu, and a small black rock, barely above water, is about the same distance southwest of the island. There are depths of 5 fathoms between Manana and Kaohikaipu but passage is not recommended for strangers because of the reefs that make off from both islands. Depths are 4 to 6 fathoms in the bight between Kaohikaipu Island and Makapuu Head; passage is not recommended.

Chart 4117.—Kauai Channel, northwest of Oahu, is wide, deep, and clear. During the trades the current usually sets westward across the channel and divides at Kauai, part following the north side of the island and the other part following the south side. Strong southerly or southwesterly winds cause the current to set in the opposite direction to that produced by the trades.

KAUAI ISLAND (Chart 4100), 63 miles northwestward across Kauai Channel from Oahu, has an area of 553 square statute miles and is fourth largest of the eight major islands. Kauai measures 29 nautical miles east-west by 23 miles north-south and slopes from centrally located **Kawaikini,** a 5,170-foot peak. **Lihue** (1960 pop. 3,908; P.O.), the seat of Kauai County, is 2 miles inland from the east-coast port of Nawiliwili.

The mountains on the west and north sides of Kauai descend in steep, jagged ridges; the gentle slopes on the east and south sides are cut by numerous gulches. The peaks are nearly always cloud-covered, making them difficut to see from any great distance. Dome-shaped **Haupu,** 2,280 feet high, is prominent in the southeastern part of the island. The entire northwest coast is backed by high bluffs; the rest of the coast is mostly low and rocky with some scattered sand beaches. A low coastal plain extends westward from the town of Waimea. The few outlying dangers can be avoided by giving the coast a berth of 2 miles.

Harbors and ports.—Nawiliwili, on the east coast, and Port Allen, on the south coast, are the only commercial harbors on Kauai and are the only places that afford shelter in almost all weather.

Currents.—The oceanic currents in the vicinity of Kauai generally follow the winds. The available local information relative to currents is given in the discussions of the various localities.

Weather.—The trade winds divide on the easterly side of Kauai, part following the north coast and part the south coast, and uniting again some distance west of the island. On the west side, between Mana Point and Makaha Point, calm or light variable airs prevail. A moderate southwest wind is sometimes felt at Waimea Bay, while a strong east wind is blowing about 2 miles offshore. Along the northerly and southerly shores the early morning trade wind is usually light until about 0900, and again decreases in strength about 1600. Occasionally kona winds, starting in the southeast, displace the normal trades; this condition occurs more often during the winter months.

The east and north, or windward, sides of the island are noted for their heavy rainfall, which reaches a maximum yearly average of more than 400 inches on **Mount Waialeale.** The lower slopes have much less rain, and along the southerly side the fall seldom exceeds 20 inches. The winter months, from December to March, produce the strongest winds, which sometimes reach gale force and are accompanied by more rain than is usual at other times of the year.

Supplies and repairs.—Food supplies are obtainable at the various towns on the island, particularly at Lihue, the county seat. Ship chandlery is limited to small-craft requirements and occasionally must be ordered from Hono-

lulu. Fuel and water are available at Nawiliwili and Port Allen; limited bunker oil is available at Port Allen. The island has no repair facilities for medium or large vessels but minor repairs can be made at Port Allen. Small vessels can be hauled out at Nawiliwili. Some of the plantations have shops capable of handling small machine repairs.

Communications.—Port Allen and Nawiliwili are ports for a few interisland barges and transpacific vessels. Interisland passenger traffic is by air. Radiotelephone communication is available to the other islands and to the mainland. A good highway skirts the island except on the northwest side.

Chart 4111.—Nawiliwili Bay, on the southeast side of Kauai, has an entrance width of 0.8 mile between Carter and Ninini Points and an inland extent of about a mile. **Nawiliwili,** on the north side of the bay, is one of the two commercial deepwater ports on Kauai and is protected by a breakwater extending northeastward from Carter Point and by a jetty in the inner harbor. Southeast winds produce some surge but the harbor is otherwise secure.

Prominent features.—The shore consists of rocky bluffs, except at the mouth of Huleia Stream and in the vicinity of Nawiliwili. The jagged, mountainous coast extending southwestward from the bay is in marked contrast with the lowlands of Huleia Stream, on the southwest side of the bay, and affords a means of fixing the entrance from well offshore. A water tank on the wharf and a large white bulk sugar warehouse on the hill overlooking the wharf are conspicuous.

Ninini Point, on the north side of the entrance, is low, flat, and rocky, and is backed by land planted in cane. A rocky ledge with a depth of 12 feet at the outer end extends about 100 yards southward of the point. **Nawiliwili Harbor Light (21°57.5′ N., 159°20.3′ W.),** 118 feet above the water, is shown from an 86-foot buff-colored cylindrical concrete tower on the point. The loom of the light is frequently seen by vessels 40 miles away.

Kukii Point, 0.7 mile westward of Ninini Point and the north entrance point of the inner harbor, is a high bluff with a low, rocky shelf at the base. There is a light on the point.

Carter Point, on the south side of the entrance to Nawiliwili Bay, is rocky and rises rapidly to **Kalanipuu,** which is 758 feet high; the hill is marked by an aviation obstruction light. The mountain spur that extends inland rises to Haupu, the most prominent feature of southeastern Kauai.

Kawai Point, 0.5 mile south of Carter Point, is a bold rocky headland, 525 feet high, very irregular and jagged in appearance.

Channels.—A Federal project provides for an entrance channel 40 feet deep to a harbor basin 35 feet deep. The channel and basin are maintained at or near project depths; markers include lights, and lighted and unlighted buoys.

Anchorage with some protection from the trades can be found between Ninini and Kukii Points, outside the breakwater, although it is reported that the holding ground is poor. Small boats can find excellent anchorage in **Huleia Stream,** except when the sandbar at the mouth closes the entrance. The stream which empties into the southwesterly end of the bay is navigable for small craft only at high water to the first footbridge, about 2 miles above the entrance, where a dam obstructs further passage. Small boats sometimes anchor in the bight between Ninini Point and the seawall north of the jetty. The bottom is sand and coral and there is a sand beach at the head of the bight.

Caution when entering.—The reverse turn, first around the breakwater and then around the seawall, which must be made when approaching the wharf, is difficult for large vessels in all but calm weather, and the assistance of a tug is usually needed. Vessels are sometimes required to drop anchor before warping alongside. The harbor has little surge.

Tide.—The diurnal range of tide is 1.8 feet at Nawiliwili.

Weather.—See Appendix for Nawiliwili **storm warning displays** and for **Lihue climatological table.**

Pilotage is compulsory for all foreign vessels and for U.S. commercial vessels under register in the foreign trade. Pilotage is optional for coastwise vessels who have on board a pilot licensed by the Federal government.

Towage.—A 300-H.P. tug and launches for handling lines are available. The assistance of the tug is usually necessary when approaching or leaving the wharf.

Quarantine.—The quarantine officer usually boards at the dock. The U.S. Public Health Serivce maintains an outpatient office at Lihue.

Customs.—A customs officer from Port Allen usually attends vessels on arrival at the dock.

Immigration matters are arranged through the office at Honolulu.

Harbor regulations.—These are established by the Harbors Division of the Hawaii Department of Transportation and enforced by the harbormaster who is also the pilot.

Wharves.—The State-owned pier provides cargo sheds and 990 feet of berthing space. State-owned pipelines are available for molasses, liquid fertilizer, and petroleum products. Private facilities include bulk-handling equipment and storage area for sugar, molasses, liquid fertilizer, and petroleum products.

Supplies.—Gasoline, kerosene, fuel oil, and fresh water are piped to the wharf. Diesel fuel is available by truck in small quantities. Some provisions and supplies are available at Lihue. Ship chandlery is limited to items for small craft.

Repairs.—A boat lift in the harbor can handle vessels up to 65 feet in length; the yard has a small machine shop.

Kawelikoa Point, 4 miles southwest of Nawiliwili Bay, is a dark, rocky headland 687 feet high. The point is at the seaward end of a ridge which extends northward to Mount Haupu.

From about 1.5 miles southwest of Kawelikoa Point to Hanapepe Bay, the coast is a series of low bluffs and beaches; the back country is mostly under cultivation, and the cane fields extend well up the slopes in some places.

Makahuena Point, 7 miles southwest of Nawiliwili Bay, is the southern extremity of Kauai. The low, flat point has a rocky shore with bluffs 20 to 50 feet in height. The land near the point is sandy and rolling, and there are short stretches of sand beach both northeast and west of the point. **Makahuena Point Light (21°52.3′ N., 159°26.8′ W.),** 80 feet above the water, is shown from a 20-foot wide pyramidal concrete tower on the point. A 335-foot Loran tower on the point is conspicuous. The bottom slopes gradually to a depth of 7 fathoms about 0.5 mile off the point. Several reefs extend about 300 yards offshore between the point and Koloa Landing.

There is a conspicuous mill stack at **Koloa** (1960 pop. 1,426; P.O.), 2 miles inland from Makahuena Point. The stack is visible all along this coast except for the short distance where it is hidden by **Paa Cones,** which are on a long, low ridge that extends inland from the point.

Koloa Landing, 1.5 miles westward of Makahuena Point, has a walled-in landing slip that affords fair protection for small craft in trade-wind weather but is completely exposed to the south. Anchorage is available in depths of 12 fathoms, rocky bottom, about 400 yards south of the landing. A road leads inland to Koloa.

Kuhio Park is 0.5 mile west of Koloa Landing and on the shore road. There are several beach houses between the landing and the park.

Kukuiula Bay, 3 miles west of Makahuena Point, has an entrance width of 150 yards and an inland extent of 300 yards; considerable protection is afforded small craft except in southerly winds. There is a breakwater on the reef that extends from the southeastern point of the bay; the concrete wharf on the inner side of the breakwater can be lighted and is used for loading and unloading small craft. **Kukuiula** is a settlement at the head of the bay. A quarter mile west of Kukuiula is the **Spouting Horn,** a sea-water spout which is active even in smooth weather.

Lawai Bay, 3.5 miles west of Makahuena Point, has an entrance width of 300 yards and an inland extent of 0.2 mile; fair protection is afforded small craft except in southerly winds. The side shores of the bay are low and rocky but there is a wide sand beach at the head. A grass-topped rock, 70 feet high, stands at the upper edge of the sand on the west side of the bay.

Makaokahai Point, 4.6 miles westward of Makahuena Point, is easily recognized because of the several hills extending northward from it. One particularly prominent hill, 0.5 mile inland, is 436 feet high and well-rounded, has canefields on the lower slopes, and is evenly capped with trees. The first low hills on the point are the walls of a water-filled crater.

Lanipuao Rock, with 3 feet of water over it, is about 0.3 mile southeast of Makaokahai Point and is marked by a lighted buoy. Vessels should not attempt to pass northward of the buoy.

Chart 4108.—Wahiawa Bay, 2.8 miles westward of Makaokahai Point and 1 mile east of Port Allen, is 170 yards wide at the entrance and indents the coast about 0.2 mile. Excellent protection is afforded small craft in all but southerly winds. Boats anchor in depths of 5 to 10 feet, sandy bottom. The sides of the bay are rocky. The seas usually break over the shoal 100 yards off **Weli Point,** on the southeastern side of the bay.

Hanapepe Bay, midway along the south coast of Kauai, is the approach to **Port Allen.** The bay is about 0.6 mile wide and indents the coast about 0.4 mile. A breakwater protects the dock at Port Allen on the eastern side of the bay. The shores are low, rocky bluffs except at the head of the bay, where there is a sandy beach.

Local magnetic disturbance.—Differences of as much as 2¼° from normal variation have been observed at Hanapepe Bay.

Prominent features.—Hanapepe Bay Breakwater Light (21°54.0′ N., 159°35.6′ W.), 32 feet above the water, is shown from a white pyramidal concrete tower on the end of the breakwater. On the eastern side of the bay are several oil tanks and warehouses. A light is on low, flat, and rocky **Puolo Point** on the west side of the bay. An airport used only by small planes is back of the point. A mill stack and buildings are 2 miles east of Port Allen.

Channels.—A Federal project provides for 35-foot depths in entrance channel and harbor basin. Controlling depth in basin was 30 feet in May 1963. Channel markers include lighted and unlighted buoys.

A reef extends about 200 yards from the shore eastward of the inner end of the breakwater. In heavy weather breakers extend 350 yards offshore on the northwest side of the bay and 50 to 150 yards off the southeasterly side of Puolo Point.

Anchorage.—The usual anchorage off Port Allen is in depths of 9 fathoms, coral and sand bottom, about 0.5 mile southeastward of the breakwater light. This anchorage is just within the red sector of the light on Puolo Point. The harbor affords shelter for all craft in almost all weather, but may become congested. A small-craft harbor, protected by breakwaters, is about 100 yards north of the pier.

Tides and currents.—The diurnal range of tide is 1.7 feet at Port Allen. The prevailing current off Puolo Point is westerly.

Pilotage is compulsory for all foreign vessels and U.S. commercial vessels under register in the foreign trade. Pilotage is optional for coastwise vessels who have on board a pilot licensed by the Federal government. The pilot will board day or night about a mile off the entrance.

Towage.—A small 65-foot, 275 h.p. tug is available at the port.

Quarantine, Customs, and Immigration officials board vessels at the dock. Port Allen is a customs port of entry. There is a private hospital in the area.

Harbor regulations.—These are established by the Harbors Division of the Hawaii Department of Transportation and enforced by the harbormaster.

Wharves.—The State pier provides 600 feet of berthing space on each side with depths ranging from 24 to 35 feet. A transit shed on the wharf has 36,000 square feet of storage space. Public pipelines are on the wharf and private bulk handling and storage facilities for molasses, liquid fertilizer, and petroleum products are in the port.

Ships are required to drop an anchor when approach-

ing the pier. This assists in maneuvering to a berth as well as getting away in an emergency. During and after strong trade winds some surge is experienced at the pier. This condition may require small and medium craft to cast off but does not interfere with the cargo handling of large vessels.

Supplies.—Fresh water and limited amounts of gasoline, fuel oil, and diesel fuel are supplied by tank truck. Groceries are available in the principal towns on the island. Marine hardware is limited to small-craft items.

Repairs.—Facilities for minor repairs to vessels are available.

Communications.—Port Allen has highway and telephone communication with other parts of the island and radiotelephone and air communication with the other islands of the group. The town is a port of call for interisland barge and transpacific vessels.

Chart 4114.—Kaumakani (1960 pop. 921; P.O.) is 2 miles northwest of Puolo Point and a half mile inland. A mill stack is prominent.

Robinson Landing, a mile northwest of Kaumakani, is a small-boat harbor with a dredged entrance that accommodates drafts of 2 to 4 feet. A stone wall has been built around the harbor edges, and a marine railway is available for hauling small craft.

Hoanuanu Bay, 2 miles northwest of Kaumakani, has depths of 2 to 3 fathoms and affords good protection from trade winds for small craft. The east side of the bay is rocky; the northwest side is a sand beach.

A breaking area extends 0.5 mile off **Poo Point,** which is on the northwest side of Hoanuanu Bay. A buoy is moored in 44 feet a mile off the point.

Waimea Bay, an open bight 3 miles northwest of Kaumakani, is the approach to **Waimea** (1960 pop. 1,312; P.O.), which is the place where Captain James Cook, R.N., made his first (January 1778) landing in the islands.

Good anchorage can be found in and off Waimea Bay during ordinary weather in depths of 3 to 20 fathoms, sand bottom. Small boats usually shift anchorage to Hoanuanu Bay for better protection when the trades are strong. Depths of 5 to 18 feet extend 0.3 mile from the shore of Waimea Bay. The Waimea pier has depths of 11 feet at its outer end but these could be changed by the wave action on the sand bottom. Small craft seldom use the pier because of the heavy swell. Groceries are available in limited quantities at Waimea, and the town has a hospital.

Waimea River, which empties into Waimea Bay along the east side of Waimea, is navigable only for pulling boats because of the bar across the mouth; the river descends from the mountains through the deepest gorge on this part of Kauai. The ruins of a Russian fort are on the east side of the river's mouth; the fort was built in 1815 and abandoned in 1817.

Between Waimea River and **Oomano Point,** 2.3 miles to the westward, a reef extends 0.4 mile from shore and breaks in heavy weather. **Kikiaola Boat Harbor,** 1.6 miles west of the river, is entered over the reef and is protected by breakwaters. The harbor has finger piers and a small marine railway; the entrance is marked by a range. The controlling depth is about 5 feet over the reef and in the basin.

Chart 4100.—A low plain, about 2 miles wide, extends westward from Waimea River around Kokole Point and northward to the Barking Sands beyond Nohili Point. Sugarcane is cultivated on most of this flat area. The shore side of the plain has a growth of algaroba trees, behind which are occasional sand dunes.

Kekaha (1960 pop. 2,082; P.O.) is a plantation settlement on the northwest side of Oomano Point and 2.5 miles from Waimea River.

Kokole Point, 5 miles west-northwestward of Waimea River, is low, rounding, and wooded. **Kokole Light (21°58.9′ N., 159°45.5′ W.),** 58 feet above the water, is shown from a 43-foot white pyramidal skeleton tower on the point.

Mana Point, about 3.5 miles northward of Kokole Point, is the westernmost extremity of the island. Along the water's edge is a strip of sand which extends 2 miles on either side of the point, but the sea breaks on a lava ledge at the edge of the sand, making the beaching of boats dangerous except when the sea is smooth.

Current observations taken during a 24-hour period 0.5 mile off Mana Point show a tidal current of 0.8 knot velocity at strength setting southward and northward along the coast. The southward maximum occurs about 3 hours after low water at Honolulu and the northward maximum 3 hours after high water. Similar observations taken near the coast about 3.5 miles southeastward of Nohili Point show a tidal current with velocities generally less than 0.5 knot.

Discolored water, caused by the drainage canals and the undertow from the beach, is often noted as far as 2 miles off Mana and Kokole Points. The village of **Mana,** 1 mile inland from the point, is marked by several large bushy trees and tall coconut palm trees. An aviation control tower at Bonham Air Force Base one mile southwest of Mana is prominent.

Nohili Point, about 6 miles northward of Kokole Point, is marked by **Nohili Dune,** 100 feet high, and the highest and southernmost of a chain of sand dunes extending along the coast for 2.5 miles to the northeastward. The dunes are known as **Barking Sands** and mark the northern limits of the cane fields. A road continues to Polihale.

A narrow sand shoal, with depths of 7 to 10 fathoms, extends from Nohili Point to **Alapii Point,** 7.5 miles to the northeastward. The shoal, which appears to be a succession of east-west sand ridges, lies 1 to 2 miles from shore. A depth of 3 fathoms is 0.5 mile west of Alapii Point; from there to Kailiu Point, 7 miles farther to the northeastward, the 15-fathom curve is at an average distance of 1 mile from shore.

From Barking Sands northeastward to Kailiu Point, the coast is rocky and precipitous. The section between Alapii and Kailiu Points consists of a series of cliffs known as **Napali.** These cliffs are 2,000 feet high in some places,

and are cut up by numerous streams which form small waterfalls. The southerly part of this section is practically bare, but the northerly part is wooded.

Kalalau Valley, 2.5 miles northeast of Alapii Point, is the broadest and deepest valley along the northwest coast and is easily distinguished from seaward.

Kailiu Point, on the north coast of Kauai, is the seaward end of a jagged ridge which ends abruptly in a sharp peak 1,200 feet high. There is a narrow strip of lowland at the point.

Chart 4118.—Haena Point, 1.2 miles east of Kailiu Point, is low and rounding. A reef, which bares at low water, extends 0.3 mile northwestward from the point. The **Haena Caves,** which cannot be seen from seaward, are 0.2 mile inland under the bold face of the mountains; the caves are near the western end of the highway which skirts the north shore of Kauai.

Wainiha Bay, 1.3 miles east of Haena Point, has an entrance width of 0.5 mile between the extensive **Kepuhi Point** reef on the west and **Kolokolo Point** on the east; inland extent is 0.4 mile. The bay is an open bight which affords little protection except in kona weather. **Wainiha River** empties into the head of the bay from the most westerly of the deep valleys along the north coast of Kauai.

Lumahai River, which is unnavigable, empties into the sea on the east side of Kolokolo Point; east of the river mouth is a sandy beach with a few rocky patches. The river valley is the western limit of the many rice fields on the north side of Kauai.

Makahoa Point, 2 miles east-southeastward of Haena Point, is black and rocky. A half mile inland is Puu Ka Manu, a 714-foot hill.

Hanalei Bay has an entrance width of a mile between Makahoa Point on the west and the extensive Puu Poa Point reef on the northeast; inland extent is nearly a mile. Breaking coral reefs fringe the shores on both sides of the entrance. Seas break across the entire entrance during northerly or northwesterly gales but good protection is afforded from the easterly trades. Midbay anchorage is in depths of 6 fathoms, sandy bottom.

Along the sandy beach at the head of Hanalei Bay are clumps of ironwood and coconut trees and the houses of **Hanalei** (1960 pop. 370; P.O.). The highway is close to the shore. Three miles inland the mountains attain heights of more than 4,000 feet.

Hanalei River, which empties into the east side of the bay, is navigable for shallow-draft boats for a distance of 2 or 3 miles; at high water a depth of 4½ feet can be carried over the bar at the mouth. A clump of ironwood trees is prominent on the north side of the river's mouth. A wharf, with a depth of about 4 feet at the outer end, is on the eastern side of the bay and 200 yards south of the Hanalei River. The wharf is unsafe. A prominent large white luxury hotel and cottages are on the bluff on the north side of the river near the entrance.

Waioli Stream and **Waipa Stream,** which empty into the head of Hanalei Bay, are not navigable. Rice and taro are grown extensively along these streams and along Hanalei River.

Puu Poa Point, on the easterly side of Hanalei Bay, is a bluff about 50 feet high, back of which a green ridge extends inland.

From offshore the northerly side of Kauai presents a very irregular and jagged skyline, with ridges extending in all directions. In the northwesterly part of the island these ridges often end abruptly at the sea. The mountains are heavily wooded. The coast between Hanalei and Kalihiwai Bays is a series of more or less wooded bluffs, cut up by gulches, back of which a rolling plain extends to the mountains. Between the shore and the highway, 1 mile inland, are pineapple and sugarcane fields.

Kalihiwai Bay, 4.5 miles eastward of Hanalei Bay, is about 0.5 mile in diameter. **Pukamoe Point,** a red precipitous bluff about 150 feet high, is on the east side of the entrance. Several houses are scattered along the sand beach at the head of the bay, which is backed by a wooded gulch. Indifferent anchorage, with poor holding ground, can be found in depths of 5 fathoms in the center of the bay, but a heavy swell sets in during northerly winds. A rock awash lies 150 yards north of Pukamoe Point. A reef, 0.2 mile wide and bare at low water, fringes the shore for 2.5 miles westward from Kalihiwai Bay and vessels should stay at least 0.8 mile offshore. A shore road, with beach houses along it, extends westward from the bay for 1.5 miles.

Kilauea Point, the northern extremity of Kauai Island, is a grass-covered bluff about 165 feet high. **Kilauea Point Light (22°14.1′ N., 159°24.3′ W.),** 216 feet above the water, is shown from a 52-foot white conical concrete tower; a radiobeacon is at the light. **Mokuaeae Island,** 200 yards off Kilauea Point, is a black, flat, grass-topped rock about 200 yards in diameter and 92 feet high. The island is the most prominent feature in the vicinity to coasting vessels.

Kilauea (1960 pop. 665; P.O.), 1.3 miles inland from Kilauea Point, is not easily seen when close to shore. The sugar of the district is trucked to Nawiliwili for shipment.

Between Kilauea Point and Mokolea Point the coast is bluff, rising gradually from each point to an elevation of about 500 feet midway between them.

Makapili Rock, 0.8 mile southeast of Kilauea Point, is 156 feet high, black, and prominent. The rock is on the outer end of a narrow neck of land which juts out 200 yards from the general coastline.

Mokolea Point, 1.2 miles southeastward of Kilauea Point, is narrow, 140 feet high, and projects out 0.3 mile from the general coastline. The point is on the northwest side of Kilauea Bay and has two old buildings near its outer end.

Kilauea Bay has an entrance width of 0.5 mile and an inland extent of 0.5 mile. The bay is open to the trades but offers some protection in westerly weather. A narrow coral reef fringes the shore, and **Kilauea Stream** empties into the head of the bay. Anchorage can be found in depths of 6 fathoms, rocky bottom, near the center of the bay.

Low **Kepuhi Point** is 2 miles eastward of Mokolea Point. The low coast between the two points is fringed with a narrow coral reef.

Chart 4100.—Moloaa Bay, 4.5 miles southeast of Kilauea Point, has an entrance width of 0.3 mile and extends the same distance inland to the mouth of a gulch. Little protection is afforded from the heavy swell that sets into the bay during the trades, but anchorage is possible during southerly winds in depths of 3 to 6 fathoms in midbay. There are a few houses along the sand beach at the head of the bay, and rice is grown in the gulch. The interior between Moloaa and Anahola Bays is used principally for pineapple cultivation and for grazing.

Papaa Bay, 6 miles southeast of Kilauea Point, is a small bight which is wide open to the trades. The central part of the bay is foul and there is a rock awash 300 yards from shore. A coral reef fringes the south shore.

Anahola Bay, 7.5 miles southeast of Kilauea Point, is a small bight exposed to the trades. **Kahala Point,** a low bluff with a grove of ironwood trees near the outer end, is on the southeast side of the bay. A light is shown from the point. A water tank a mile westward of the light is prominent. Discolored water frequently extends for a considerable distance off **Kuaehu Point,** on the northwest side of the bay. A reef extends about 0.3 mile from Kuaehu Point. Because of the numerous reefs, strangers should not attempt to enter the bay. In moderately smooth weather small vessels can find anchorage well inside the bay in depths of 4 to 6 fathoms, mud bottom.

Pinnacle Peak, 1.3 miles inland from Anahola Bay, is a tall, dark spire, with green slopes, that stands out more prominently than any other land feature on this part of the island.

Between Kahala Point and Kealia are low coastal bluffs and a rocky shore with some patches of sand.

Kealia (P.O.), 3 miles southward of Kahala Point, is a plantation village. A short breakwater, extending southeastward from the shore, affords some protection from northerly weather for shallow-draft boats. The breakwater is not kept in repair, and portions have been carried away by the sea. Vessels should not approach the village without local knowledge. About 0.7 mile south of Kealia, a flat building on a low hill is prominent from offshore.

Kapaa (1960 pop. 3,439; P.O.), 5 miles southward of Kahala Point, is scattered along the beach. A reef, which is 0.3 mile wide in some places, extends alongshore from north of Kapaa to Hanamaulu Bay. An opening in the reef at Kapaa is usually marked by breakers on either side. Sampans find anchorage in depths of about 2 fathoms behind the reef and about 150 yards off the northern side of the village.

Wailua (1960 pop. 1,129) is a settlement at the mouth of **Wailua River,** which empties into small **Lehuawehe Bay** 6.5 miles southward of Kahala Point. The river, which is spanned by a bridge at its mouth, is navigable for small boats for several miles, once the shifting bar at the mouth is passed. Vessels may find unprotected anchorage off Wailua in depths of 10 to 15 fathoms, rocky bottom, but, like the whole northeast coast of the island, anchorage is not safe when the trade winds are blowing. **Waipouli** is a village 1 mile northeastward along the highway from Wailua.

Nonou, 1.3 miles northwestward of Wailua and 1,238 feet high, is the northernmost and highest of the low mountains near the coast.

Kalepa Ridge is 1 mile inland and parallels the coast from Wailua to Hanamaulu Bay. The southern end of the ridge, which is about 700 feet high, is marked by several buildings high on the seaward face of the bluff. The buildings can be seen for many miles offshore and are a good leading mark for Hanamaulu Bay.

Chart 4112.—Hanamaulu Bay, 10 miles southward of Kahala Point and 2.6 miles northward of Nawiliwili, is about 0.3 mile wide and indents the coast about 0.5 mile. **Ahukini Landing** is on the point on the south side of the entrance. Only the outer third of the bay has deep water; the sand and coral bottom slopes gradually from the 18-foot curve to the beach at the head of the bay. The shores of the bay are low, rocky bluffs, about 40 feet high, except for the white sand beach at the head. A fringe of trees on the bluffs forms a windbreak for the extensive cane fields on either side of the bay. **Hanamaulu Stream,** which empties into the head of the bay, is not navigable.

The 20-foot concrete tower of an abandoned lighthouse is on the outer end of the 300-foot stone breakwater which projects from the south point of Hanamaulu Bay entrance; a small wooden pier is at the inner end of the breakwater. The bay is no longer used by large vessels. Only the concrete piling remains of the former wharf at Ahukini Landing, and most of the port installations are in ruins. A heavy outside swell causes a heavy surge in the harbor.

Chart 4100.—From Hanamaulu Bay to Nawiliwili the coast is a series of low bluffs with occasional stretches of sand beach; there are no off-lying dangers. Sugarcane is grown extensively on the land back of the beach. An aero light at Lihue Airport is 0.7 mile south of Hanamaulu Bay.

Chart 4117.—Kaulakahi Channel, between Kauai and Niihau, is about 15 miles wide and clear of obstructions. Off Mana Point the trade wind following the south coast of Kauai meets the air current that has followed around the north side. The trades blow directly across the lowlands of Niihau, but part is deflected southward and around the southeast point of the island.

Currents.—Little is known of the current in Kaulakahi Channel, but presumably it is variable depending mainly upon the velocity and direction of the wind. There appears to be a general northwestward flow along the southwest coast of Kauai. It is reported that a current sometimes sets southward along the east coast of Niihau at the same time that the current is setting northwestward along the Kauai coast. There are noticeable tidal currents near the western extremity of Kauai.

NIIHAU ISLAND (Chart 4117), 15 miles westward across Kaulakahi Channel from Kauai, is seventh in size and westernmost of the eight major islands. Niihau has an area of 72 square statute miles, a northeast-southwest length of 16 nautical miles, and an average width of 3.5 miles. Near the middle of the island is a high tableland with occasional rises or cones, the highest of which is 1,281-foot **Paniau.** The northerly and easterly ends of the tableland are precipitous and vary in height from 600 to 1,000 feet; the southerly and westerly slopes are gradual. A dirt road follows the west coast of Niihau for most of its length. The island has no streams.

The population of Niihau was 254 in 1960. One family owns the entire island and operates it as a cattle ranch. There is no scheduled communication with the island.

Lehua Island, about 0.6 mile off the north end of Niihau, is a small rocky, crescent-shaped island, with the crescent open to the northward. The easterly and westerly points are low, rising gradually to an elevation of about 700 feet near the center of the island. On the westerly point is a natural arch. **Lehua Rock Light (22°01.4′ N., 160°06.0′ W.),** 709 feet above the water and visible 12 miles, is shown from a white skeleton tower on the summit of Lehua Island.

Lehua Channel, between Niihau and Lehua, is restricted on its southerly side by rocks that show above water and extend about halfway across it. A depth of 7 fathoms can be carried through the channel by staying within about 350 yards of the Lehua shore. In heavy northwest weather the swell almost breaks in the passage, and as little is to be gained by using the channel, vessels should pass northward of Lehua Island. The current through the channel varies with the tide and sets in both directions with a velocity of about 1.5 knots.

To the eastward of Lehua Channel vessels should give the north coast of Niihau a berth of 0.5 mile; to the westward the clearance should be about 1 mile.

Puukole Point, on the north end of Niihau, is low, as is **Kikepa Point,** 1 mile to the eastward. Between these points and the high bluff on the northerly side of the tableland, the land is low and grass-covered, with a few low hills. From a distance this lowland is not visible and Lehua Island appears to be about 3.5 miles from Niihau.

Kaunuopou Point, 1.8 miles southeast of Kikepa Point, is the easternmost point of Niihau. **Kaunuopou Rocks,** over which the sea breaks, are 300 yards off the point. Another rock, about 0.4 mile off the southern side of the point, usually breaks and should be given a good berth by vessels approaching Kii Landing.

Kii Landing, in a small bight about 0.7 mile west of Kaunuopou Point, is only slightly protected from the trade winds. The landing is usable in ordinary weather, but not in southerly weather. The landing is built on beach boulders and has depths of only 2 or 3 feet alongside. Anchorage can be had in depths of about 8 fathoms, coral bottom, about 0.6 mile off the landing.

About 1.3 miles southward of Kii Landing a reef, with about 1 fathom of water over it and usually breaking, extends 0.5 mile offshore. The 10-fathom curve is about 1 mile offshore. From the vicinity of the reef to Pueo Point the coastline consists of cliffs reaching a height of 1,000 feet.

Pueo Point, 5 miles southward of Kaunuopou Point, is a prominent brown, precipitous bluff about 800 feet high. Southwestward from the point for a distance of about 4.5 miles the coastline consists of bluffs which gradually diminish in height toward the lowlands of the southern half of the island. The bluffs are broken by small bights, most of which have short sand or pebble beaches where boats could land during smooth weather. Beyond the bluffs to Kawaihoa Point, a distance of about 6 miles, the coast consists of a series of low bluffs about 15 feet high, with stretches of sand beach, a few sand dunes, and scattered trees. Between Pueo Point and Kawaihoa Point are no known outlying dangers, the few isolated rocks being very close to the shore.

The lowland of the southern part of the island is broken by two hills, one on Kawaihoa Point and the other, **Kawaewae,** a gently rounded hill 315 feet high, which is 4 miles north of the cape and 1.3 miles inland from the west coast.

Kawaihoa Point, the southernmost point of Niihau, is formed by a hill 548 feet high, the seaward face of which is steep. From a distance the hill has the appearance of an island and can easily be mistaken for Kaula Island. Deep water is close to the point. About 2 miles south of the cape there is a prevailing westerly current which reaches a velocity of about 1.5 knots.

Beyond Kawaihoa Point the coast gradually curves northwestward and northward and is low and rocky with occasional short sand beaches. At **Leahi Point,** 1.7 miles westward of Kawaihoa Point, the 10-fathom curve is 0.6 mile offshore. A dirt road skirts the western shore.

The coast between **Kamalino,** a former village 4 miles northwestward of Kawaihoa Point, and Puukole Point is practically one low, continuous beach, with an occasional group of rocks. Near the beach are numerous sand dunes covered with sparse vegetation. In the vicinity of Kamalino weak currents have been reported setting northward and southward along the coast.

Nonopapa Landing, 5.5 miles northwestward of Kawaihoa Point, is the principal landing on the island. Local vessels call occasionally for the island's cattle. The landing is used only from May to September, as there is often a heavy northerly swell during the winter months. The landing is marked by a shed and derrick on a short concrete retaining wall at the north end of a long sand beach. **Kaeo,** a cone 1,018 feet high and near the center of the tableland, shows on the skyline from the anchorage.

Anchorage is available in depths of 8 fathoms, coral and sand bottom, about 660 yards off the derrick, with the landing shed and Kaeo in range and bearing 070°. Kawaewae is 1.5 miles 135° from the anchorage. The landing is somewhat protected by a small reef extending about 75 yards southwest from the end of the retaining wall. Small boats approaching the landing head south of it until the reef is rounded. **Puuwai,** the principal village of the island, is about 2.5 miles northeast of the landing.

Kuakumoku Rock, 1.6 miles northward of Nonopapa Landing, is a large, single rock about 4 feet above water

and near the center of a reef some 200 yards in diameter and 500 yards offshore. The reef should be given a berth of 0.5 mile, and only small craft should attempt the passage between the reef and the shore. Other reefs extend about 0.5 mile offshore 0.5 mile south and 3 miles northeast of Kuakumoku Rock.

Kaununui Point, 4.5 miles northeastward of Kuakumoku Rock, is marked by a group of rocks a few feet high and close to the shore. A coral reef with depths of 6¼ fathoms over it lies 1.5 miles off the point. It is reported that the reef breaks in heavy weather. The passage inside the reef is not recommended except for small boats.

Keawanui Bay is no more than a slight curve in the shoreline that extends northeastward from Kaununui Point for 3 miles. The bay has a sand and coral bottom and a sandy shore. A rock with 2 feet of water over it lies in the southern part of the bay, 0.8 mile northward of Kaununui Point, and 0.5 mile offshore.

From the northern side of the bay to Puukole Point the coast is foul for a distance of about a mile offshore. Vessels should give this section of the coast a berth of at least 1 mile. About 2 miles westward of Puukole Point and 0.9 mile offshore is a reef with reported depths of 12 feet over it. A mile southward of this reef and 0.8 mile offshore is a rock with 5 feet of water over it.

Kaula, 19 miles southwestward of Niihau, is a small bare, rocky islet, 550 feet high. Vessels have anchored close to both the south and east sides of Kaula in depths of about 20 fathoms, but as the islet is only 0.7 mile long, little protection is afforded. A rock with a least depth of 5 fathoms lies 3.8 miles 300° from the highest point of Kaula. A bank with depths of 30 to 40 fathoms extends 5 miles northwestward from the islet.

The **danger zone** of an aerial bombing and strafing target is centered on Kaula; **see 204.223, Chapter 2, for limits and regulations.**

OUTER ISLANDS (Chart 4000).—The small rocky islands, reefs, and atolls west-northwestward from Niihau form a well-defined chain. Between Niihau and Gardner Pinnacles, 480 miles distant, are several widely-separated high barren rocks; continuing westward are the coral reefs and atolls.

Atolls.—An atoll may comprise one or more low coral islands situated on a strip or ring of coral surrounding a central lagoon. Many of these atolls have openings in the coral ring which permit passage of small boats, and sometimes large vessels, to anchorage in the enclosed lagoon.

Reefs.—Successful navigation through or among coral reefs is often dependent upon the eye. They are always more plainly to be seen from the masthead than from the deck or bridge. The best observing conditions are with the sun high and behind the observer, and with the sea slightly ruffled; reefs are extremely difficult to distinguish if the sea is glassy calm.

Reefs with about 3 feet of water over them appear light brownish in color; those with a fathom or more appear light green, deepening to darker green and finally deep blue. Under favorable circumstances, a reef with depths of 3 or 4 fathoms over it can be seen from aloft for a considerable distance; in greater depths, the reef can only be seen when nearly over it. Polaroid glasses have been found of great help in navigating among reefs.

Vigias.—A vigia is an indication on a chart that a dangerous rock or shoal is thought to be near the spot indicated. Doubtful navigation and strong currents account for a large proportion of the vigias that encumber or have encumbered the charts of the Pacific Ocean. Phosphorescence, seaweed scum, and shoals of fish often resemble reefs and breakers so closely as to deceive the most experienced. Many vigias have been disproved by extensive investigation, but many others are still on the charts and remain a source of annoyance to the navigator.

Chart 4181.—Nihoa (23°03′ N., 161°55′ W.), a barren, rocky, and uninhabited island, is about 120 miles northwestward of Niihau. The island was discovered by Captain Douglas of the British vessel IPHIGENIA on April 13, 1790. The low, stone walls of ancient ceremonial sites still remain on the island, and many stone images and other evidence of past visitations have been removed to the Bishop Museum in Honolulu. The island is the resort of several species of sea birds.

Nihoa is about 0.8 mile long and 0.2 mile wide. The easterly, northerly, and westerly sides are high and precipitous; the southerly side is much lower and its slopes are more gradual. **Millers Peak,** 910 feet high and the highest point on the island, is near the northwesterly end. **Tanager Peak,** 874 feet high, is near the northeasterly end. The southeast and southwest sides of the island terminate at points on either side of **Adams Bay.** In the bay are three small bights, the westernmost having a sand beach while the shores of the other two are rocky ledges. There is deep water, close to all sides of the island.

The safest anchorages are between the 15- and 20-fathom curves westward and southwestward of the island, but the holding ground is poor. The middle cove of Adams Bay probably affords the best landing, but the surge is considerable and great care must be taken in landing anywhere on the island. During heavy northwesterly weather landing is very dangerous. A steep trail leads from the middle cove to the top of the bluff. At the foot of the bluff is a seepage of water which is not suitable for drinking purposes except in emergencies.

Currents.—The prevailing current sets westward in the vicinity of Nihoa Island. Current observations taken about 0.2 mile west of the island show a nontidal flow of about 0.2 knot setting west-southwest combined with a tidal current of nearly 0.5 knot at strength setting northward and southward. The northward strength of the tidal current occurs about 6 hours after the local transit of the moon and the southward strength at about the time of local transit. The velocity measured was nearly 2 knots and set southward.

Local magnetic disturbance.—Differences from normal variation of as much as 33° have been observed on Nihoa.

Nihoa is near the southwesterly end of a bank which

is about 18 miles long in a northeast-southwest direction, 10 miles wide, and has depths of 14 to 36 fathoms. Another bank, the center of which is about 18 miles west by south from Nihoa, is about 14 miles long in an east-west direction, 9 miles wide, and has depths of 15 to 25 fathoms. A bank about 54 miles southeastward of Nihoa has a least depth of 32 fathoms; the two banks 57 and 70 miles westward have least depths of 29 and 33 fathoms, respectively. The edges of the banks slope steeply to much greater depths. A 9-fathom shoal is about 5 miles northwestward of the easterly bank.

Necker Island (23°34′ N., 164°42′ W.) is 158 miles west by north from Nihoa. It was discovered by La Perouse on November 1, 1786, and was annexed to Hawaii in 1895. The island, which might well be called a rock, is uninhabited, but, like Nihoa, shows unmistakable evidence of ancient habitation. It is the home of countless sea birds.

About 0.7 mile long and less than 0.2 mile wide, Necker Island is made up entirely of lava. There are four peaks or hills, one near each end and two between. The highest, **Summit Hill,** 277 feet high, is near the middle of the island. **Annexation Hill,** 249 feet high, at the southwestern end of the island, is separated from the other hills by a low saddle and, when seen from a distance, appears detached. There is a sparse growth of low brush on the upper slopes of the hills.

Northwest Cape, a rocky spur extending northward from the west end of the island, is joined to the rest of the island by a low isthmus over which the seas break in rough weather. On the west side of the cape is **West Cove,** and on the east side is **Shark Bay.** Off the east end of the island are several low, detached rocks. A depth of 5 fathoms has been reported 0.5 mile south of Necker Island where general depths are 10 to 12 fathoms.

Vessels can anchor in depths of about 12 fathoms 0.5 mile south of the southwest point of the island, but the island is so small that it affords little protection. West Cove and Shark Bay are the landing places, but there are times when it is impossible to land anywhere on the island. During heavy northwesterly weather landing at West Cove is very dangerous. Shark Bay, open to the northeast trades, is usually filled with breakers. At certain seasons of the year some water may be found in a small ravine on the southeastern side of the island. Small seepages of unpalatable water have been found on the island.

Tide.—The rise and fall of the tide is about 1 foot.

Currents.—The prevailing current sets westward, but countercurrents may be expected close to the island. Four days of current observations taken 0.2 mile west-northwest of the west end of Necker Island show a westward nontidal flow of about 0.5 knot, combined with a tidal current of about 0.8 knot at strength. Easterly trade winds prevailed during the observations.

Weather.—September is reported to be the calmest month of the year; strong north and northeast winds prevail during the other months.

Local magnetic disturbance.—Differences from the normal variation of as much as 22° have been observed on Necker Island.

Necker Island is near the northern end of a bank about 40 miles long in a northwest-southeast direction. The bank is about 15 miles wide and has depths of 8 to 23 fathoms. The sand and coral bottom is plainly visible. A 10-fathom shoal has been reported about 19 miles northeastward of Necker Island.

Charts 4171, 4172.—French Frigate Shoals, about 85 miles west by north from Necker Island, is a crescent-shaped atoll about 17 miles long in a north-northwest direction. It was discovered by La Perouse on November 6, 1786, the day after leaving Necker Island, and like that island, was annexed to Hawaii in 1895. The atoll consists of a coral reef with a number of small, bare, sand islets on it, and is flanked by a volcanic rock and numerous coral heads and reefs.

The crescent reef is double, and the outer and inner arcs bound a lagoon which is 1 to 6 miles wide. At its midpoint the windward reef lies about 8 miles from a line joining the tips of the crescent; the leeward reef is about 5 miles from this line. The windward reef is nearly continuous and can be plainly seen in the daytime for a considerable distance by vessels approaching from the north, east, or southeast. The sea practically always breaks over the reef, and the few times it is not breaking, the green shoal water inside the reef is seen in ample time to avoid danger. The bottom slopes uniformly from the reef to the 100-fathom curve 1 to 2 miles off, and there are no known dangers from north through east to south of the windward reef.

The leeward or inner reef, however, is broken in many places and, in normal weather is seldom marked by breakers. The lagoon between the reefs is foul with numerous coral heads.

A bank with depths of 8 to 20 fathoms extends about 8 miles westward from the midpoint of the inner reef. where it then drops off rapidly to great depths.

La Perouse Pinnacle (23°46′ N., 166°16′ W.), a volcanic rock about 60 yards long, 20 yards wide, and 122 feet high, lies about midway between the tips of the crescent and west of the leeward arc of the reef. The rock is so steep and rugged that it is almost inaccessible. From a distance its guano-coated outline resembles a brig under sail. A small detached lava rock about 9 feet high lies off the westerly side of the pinnacle. The points of the crescent reef, as indicated by the ends of the line of breakers, bear about 170° and 310° from La Perouse Pinnacle.

Shark Island, the northwesternmost of the sand islets, lies 6 miles northwest of La Perouse Pinnacle. A coral reef fringes the islet. **Tern Island,** about 2 miles east-northeastward of Shark Island, is marked by a Loran tower, a water tank, and an observation tower. A radiobeacon is on the island.

East Island, 3 miles east-northeast of La Perouse Pinnacle, is a low sand bar 600 yards long in a northwesterly direction and about 100 yards across. Reefs that are

691-231—63——18

awash most of the time extend a mile westward and 0.2 mile southward from the island; the southern reef seldom breaks. A coral head that sometimes breaks is 0.6 mile south of East Island. Northeast and east of the island are numerous coral heads and reefs.

The low, sandy islets between Tern Island and East Island are the nesting places of sea birds and turtles. Extreme caution must be exercised when navigating in the vicinity of these islets because of the numerous coral heads.

Channels.—The principal approach to Tern Island is through **Southwest Channel** which extends 1.5 miles southwestward from a basin at the west end of the island. The navigational aids that mark the channel are not charted because of the dangerous coral growth and the limited space in the turning basin. The channel is used exclusively by small craft of the U.S. Coast Guard.

Anchorages.—The best holding ground southwest of French Frigate Shoals is in depths of 13 to 15 fathoms, sand bottom; in lesser depths the bottom is mostly coral. There are no all-weather anchorages for large vessels, but the conformation of the reef is such that some protection can be found from choppy seas and ground swell. Small vessels can find good protection from most weather behind the shoals and coral heads.

Routes.—Vessels approaching French Frigate Shoals from the north, east, or southeast in the daytime should have no difficulty in picking out the outer reef from a considerable distance off. In clear weather, La Perouse Pinnacle is plainly visible from outside the reefs. From the south, the reef is not so easily seen. The sea may not break over the shoals, and although the bottom is plainly visible close in, the shoals might not be detected from a little distance. The 100-fathom curve is only about 0.5 mile from the shoals.

Currents.—A prevailing current sets westward in the vicinity of French Frigate Shoals, but variable currents have been noted. A southwestward current of 2 knots has been measured. A one-day series of half-hourly current observations taken 0.7 mile west of the southern end of the shoal during a period of small wind velocity shows practically no current.

Weather.—The northeast trades prevail throughout the year, but westerly blows can be expected during the winter months. The average wind velocity is 12 knots, with monthly averages of about 16 knots in December to 9.5 knots in August. Gales have been experienced in July and September. Occasional heavy showers of short duration cut visibility to about 2 miles.

Facilities.—A May 13, 1963, report from the USCGC IRONWOOD says of Tern Island, "A shipmaster would be hazarding his vessel to try to take it into this harbor. I recommend that the Coast Pilot emphasize as does Chart 4171 that small boats only should use this channel. I further recommend that any reference to logistic support available to vessels visiting Tern Island be deleted since this facility is small and unable to provide such services."

Chart 4182.—Brooks Banks and **St. Rogatien Bank** are a group of five coral banks situated between French Frigate Shoals and Gardner Pinnacles. The banks extend 50 miles in a northwesterly direction, have depths of 11 to 59 fathoms, and are separated by channels several miles wide and more than 100 fathoms deep. The largest of these banks lies 60 miles 305° from La Perouse Pinnacle, is about 12 miles in diameter, and has depths of 12 to 56 fathoms. The southeasternmost bank, the smallest in the group, is 27 miles 297° from La Perouse Pinnacle, is about 2 miles in diameter, and has depths of 28 fathoms. The northwesternmost bank is 75 miles 311° from La Perouse Pinnacle, is about 6 miles long and 4 miles wide, and has depths of 30 to 43 fathoms.

Unprotected anchorage can be had on the shoaler areas, but the holding ground is only fair. The sand and coral bottom is plainly visible. There are no dangers.

Currents.—The oceanic flow is variable, but usually sets westward. Sixty half-hourly current observations indicate a northwestward nontidal current of about 0.5 knot, combined with a tidal current of 0.8 knot at strength. The tidal current is somewhat rotary, turning clockwise. The largest velocity observed was nearly 1.5 knots setting westward.

Chart 4173.—Gardner Pinnacles (25°00′ N., 168°00′ W.) are 120 miles northwest of La Perouse Pinnacle. They were discovered by Captain Allen of the whaler MARO in June 1820. The pinnacles are a solid, volcanic rock islet, 190 feet high and about 200 yards in diameter, and a smaller rock about 100 yards from the northwest side of the larger. The rocks are barren of vegetation and are covered with guano, giving them a snow-capped appearance. The only off-lying dangers are a small rock just off the northwest side of the larger pinnacle and two 20-foot patches, one of which is about 100 yards south of the larger pinnacle and the other just north of the smaller pinnacle.

Anchorage can be had anywhere on the bank which surrounds the pinnacles, but there is no protection; in general, the holding ground is poor. In comparatively smooth weather, landings can be made just north of the bight on the west side of the larger pinnacle.

Currents.—Current observations taken at a number of locations in the vicinity of Gardner Pinnacles show a west-northwestward oceanic drift of about 0.2 knot combined with a rotary tidal current, turning clockwise, of 0.2 knot at strength. Velocities of about 2 knots setting west-southwest were measured during easterly winds.

Gardner Pinnacles lie near the northeastern side of a bank about 50 miles long, in a north-south direction, and about 20 miles wide near the northern end. The bank has depths of 10 to 25 fathoms, and the sand and coral bottom is plainly visible.

Chart 4182.—Raita Bank (25°32′ N., 169°28′ W.), lies about 85 miles 291° from Gardner Pinnacles. It was discovered in 1921 by the French schooner RAITA. The bank is about 20 miles long in a north-northeast direction and has a maximum width of about 10 miles. Depths range from 9 to 20 fathoms and the sand and coral bottom is plainly visible under ordinary weather conditions. At

the 20-fathom curve, the bottom drops off rapidly to great depths. In heavy weather, the swells seem to lump up slightly over the shoaler areas, but there are no dangers. Large schools of Ulua fish and sharks have been observed on the bank. Anchorage can be had on the bank in the open sea with fair holding ground.

Currents.—Variable currents are reported in the vicinity of Raita Bank. Current observations in the vicinity indicate a rotary tidal current turning clockwise.

Chart 4174.—Maro Reef (25°25′ N., 170°35′ W.), lies about 60 miles westward of Raita Bank. It was discovered by Captain Allen of the whaler MARO in June 1820. The large, oval-shaped, coral bank is about 31 miles long in a northwesterly direction and about 18 miles wide. The center of the bank is a large area of reefs awash. This broken area, about 12 miles long in a northwesterly direction and 5 miles wide, is extremely foul, with many coral heads awash and channels of deep water between. Only one very small rock, about 2 feet high and on the north side of the reef, shows above high water. Outside the broken portion of the reef, which is practically always marked by breakers, is the wide shelf of the bank with depths of 12 to 20 fathoms.

The bow of a T-2 tanker, stranded on the southwestern side of the reef, shows 54 feet above the water and is the only visible mark on the reef. Breakers, or the light blue-green color of the area within the broken portions of the reef, give the first warning of the proximity of danger. All maneuvering in the vicinity of the broken area must be done with extreme caution and with the sea and light such that shoal spots can be seen and avoided. Ordinarily, spots with less than 6 fathoms of water are plainly visible.

There are no dangers more than 2 miles from the general outline of broken portions of Maro Reef, thus leaving a navigable shelf with depths of 12 to 20 fathoms on all sides but the northeast where depths of 7 to 10 fathoms are found.

Vessels may anchor in the shelter of the broken portion of the reef on any side; the closer to the reef the more caution is necessary to avoid the isolated coral heads which can usually be seen in favorable sunlight. Good shelter from the northeast trades can be had on the west side between two long arms of the reef which project, one to the northwest and one to the southwest, from the main reef area. Care must be taken to avoid the 5¾ fathom spot off the middle of the entrance and the 4¼ fathom spot well inside. Vessels entering should keep within 0.5 mile of the southwest arm of the reef. However, unless the navigator is familiar with the area, he should remain as far as he can from the broken area on all sides and still obtain the desired shelter.

Currents.—In the vicinity of Maro Reef the prevailing current sets westward but variable currents have been noted. Over the bank a rotary tidal current, turning clockwise, has been reported.

Chart 4186.—Laysan Island (25°46′ N., 171°44′ W.), is a low sand island about 65 miles west-northwest of Maro Reef. The island is 1.6 miles long in a north-south direction, about 1 mile wide, and 45 feet in elevation at its highest point near the north end. In the center of the island is a salt-water lagoon about 0.9 mile long. The island is mostly white sand, although it is partly covered with low vines and grass. The island is marked by an ironwood tree which is close to the scattered ruins of a small building on the west side of the island. Water can be obtained by digging shallow wells, and sea fowl, eggs, and fish are abundant. The island is uninhabited and is seldom visited.

A coral reef, a few hundred yards wide, fringes the island. About 0.3 mile off the western shore is a small, sharp rock, about 3 feet high. Coral heads, covered with 4 to 7 fathoms of water, are numerous in the area within 1 mile of the island. The sand and coral bottom can usually be seen in depths less than 10 fathoms, and often in greater depths. When approaching closer than 1 mile, a sharp lookout must be maintained to detect the coral heads.

Vessels can anchor in depths of 8 to 15 fathoms 1 to 1.5 miles off the island on all sides, depending upon which side affords the best protection. During the trades, anchorage can be had 0.5 to 1 mile off the west side in depths of 8 to 15 fathoms, fair holding ground. Small craft drawing not over 12 feet can lie at anchor inside the reef and off the ironwood trees on the west side of the island, but this anchorage affords no protection from westerly winds. During northeasterly and southeasterly weather the best landing can be made off the ironwood trees on the west side of the island. A poor landing can be made near the northeasterly end of the island during light westerly winds. The summer months are the best for landing, as the northeast trades prevail during this period.

Currents.—A current velocity of about 1 knot and a rotary tidal current, turning clockwise, have been reported. The current is believed to depend to a great extent upon the wind.

Chart 4182.—Laysan Island is just southeastward of the center of a circular bank 14 miles in diameter, with depths of 9 to 23 fathoms, beyond which the water deepens rapidly.

Northampton Banks, unsurveyed banks with a least known depth of 17 fathoms, lie about 35 miles southwest of Laysan Island.

Chart 4186.—Lisianski Island (26°04′ N., 173°58′ W.), is a small, low, sandy island, about 120 miles westward of Laysan Island. Captain Lisianski, of the Russian ship NEVA, discovered the island on October 15, 1805, when his ship grounded on the reef and was nearly wrecked. The island is about 1.2 miles long in a north-northwest direction, 0.5 mile wide, and 20 feet in elevation at its highest point on the northeastern side. The shores are white sand except for two stretches of rock ledge at the waterline on the east side of the island. Behind the sand beach, the island is overgrown with vines

and bushes. Two coconut palm trees in the northeast part of the island are prominent from northward. Brackish water may be obtained by digging shallow wells. Sea fowl, eggs, fish, and turtles are abundant. The island is uninhabited and seldom visited. Visits should be made during the summer months, when the northeast trades prevail, but small-boat landings have been made on the east side of the island at other times.

A reef circles around to the southwestward from off the north side of the island. It is marked near its offshore end by a coral ledge which bares at times and over which the seas break. The southern end of this ledge is 1.7 miles 260° from the northern end of the island. About 0.5 mile southwestward of this point is another ledge which is marked by a breaker in most weather. Midway between these ledges or breakers is a passage leading to the lagoon between the island and the reef. The passage has an uneven bottom with depths of 11 to 22 feet. About 350 yards southwestward of the northern ledge is a small shoal with a depth of 3 feet over it. These shoal spots are easily seen and avoided by small boats making the passage into the lagoon, but vessels should not enter without local knowledge. Once inside, anchorage can be had in depths of 3 to 6 fathoms, taking care to avoid the scattered coral heads with only a few feet of water over them. Landing can be made on the west side and south end of the island in all but southwesterly and westerly weather.

Neva Shoal, with innumerable coral ledges, extends about 8 miles southeastward from Lisianski Island. This reef, which is about 4 miles wide, has its western extremity about 4 miles south-southwestward of the island. The southerly end of the reef is usually marked by breakers, and many of the ledges break in almost all weather. The shoal has areas of deeper water between the ledges, and small boats can maneuver over many parts of the reef, but it must be avoided by larger vessels.

In addition to Neva Shoal, there are many coral heads with depths of 3 to 6 fathoms over them within 3 miles of all sides of the island. A small coral ledge, with an islet on it and nearly always marked by breakers, lies 2.7 miles 254° from the south end of the island. Between this ledge and the island are depths as great as 8 fathoms and a scattering of coral heads, some of which are nearly awash. The lagoon could be entered between this ledge and the ledge marking the south side of the previously described opening 1 mile northward. A 14-foot rock, about 1.5 miles north-northeastward of the island, is marked by breakers only during heavy weather. Under favorable conditions dangerous coral heads can be seen for several hundred yards.

Anchorage can be had in trade wind weather about 3 miles west of the island in depths of 11 to 15 fathoms, sand and coral bottom, with the north end of the island bearing 080°. During southwest weather, vessels can find anchorage 3 to 4 miles east of the north end of the island in depths of 8 to 15 fathoms. Small boats can anchor in the lagoon, as described previously.

Vessels may approach to within 3 miles of Lisianski Island from the northward on courses between 270° and 090°. The island and Neva Shoal should be given a wide berth when passing southward of them, as the island is seldom seen from the southern limits of the shoal. Vessels approaching from the southwestward should keep about 5 miles westward of the meridian of the island until the island bears 090°, and then approach the anchorage.

Currents.—One-half day of current observations taken 3 miles west of Lisianski Island indicate a rotary tidal current, turning clockwise, of 0.8 knot velocity at strength. A prevailing northwestward current is reported in the vicinity of the island.

Chart 4183.—Lisianski Island and Neva Shoal lie just southeast of the center of a bank about 25 miles long in a northwesterly direction and about 15 miles wide. Outside the reefs, general depths on the bank are 9 to 47 fathoms.

Pioneer Bank (26°02′ N., 173°26′ W.), lies about 30 miles eastward of Lisianski Island. The bank is about 8 miles in diameter and soundings of 18 fathoms have been obtained near its center. No breakers or dangers were observed during a preliminary survey, but, as the least depth may not have been obtained, vessels should avoid the area.

An unsurveyed bank with least known depths of 30 fathoms is reported to be about 36 miles northwest of Lisianski Island.

Chart 4175.—Pearl and Hermes Reef, lying about 145 miles northwest of Lisianski Island, is an extensive oval-shaped atoll about 40 miles in circumference, 17 miles long in a northeasterly direction, and 9 miles wide. The reef was discovered on April 26, 1822, by the British whalers PEARL and HERMES, which were wrecked on the same night within 10 miles of each other. Within the outer reef is a lagoon in which are numerous coral reefs with deep water between. Two wrecks lie stranded on the eastern side of the reef. There are no known dangers outside the heavy breakers on the outer reef.

On the outer reef are several small islets, most of which are on the south side; the exception is **North Island.** There are also several sandbanks that are awash at high water. **Southeast Island (27°47′ N., 175°49′ W.)** is the largest of the group; five other named islands are scattered along a 7-mile stretch to westward. The islands are uninhabited and are bare of shrubbery except for a few ironwood trees.

The 6-mile opening on the northwest side of the outer reef has depths of 1 to 6 feet between the numerous coral heads. The small-boat channel between Southeast Island and **Bird Island,** next islet to the westward, has a depth of 7 feet; the channel between Bird Island and **Sand Island** has 19 feet. Lagoon entrance or navigation are definitely not for the amateur.

Anchorage can be had off the western entrance to the lagoon in depths of 8 to 12 fathoms, or on the easterly side of the reef. Vessels have anchored midway between the southern entrances and about 0.6 mile off Bird Island in

depths of 25 fathoms.

Currents.—The current appears to set northward between Lisianski Island and Pearl and Hermes Reef.

Chart 4183.—Salmon Bank. unsurveyed, lies about 60 miles southwestward from Southeast Island on Pearl and Hermes Reef. The least known depth on the bank is 30 fathoms.

Gambia Shoal, position doubtful, lies about 50 miles west-northwest of Southeast Island on Pearl and Hermes Reef. The shoal has a depth of 14 fathoms and the bottom can be plainly seen. About 25 miles northward of the chartered position of Gambia Shoal is a bank with a least known depth of 35 fathoms.

Charts 4185, 4188.—Midway Islands, 1,150 miles west-northwestward of Honolulu, were discovered in 1859 by Captain N. C. Brooks, an American shipmaster on the Hawaiian vessel GAMBIA; possession was taken on behalf of the United States on September 30, 1867, by Captain William Reynolds of the U.S.S. LACKAWANNA. The circular atoll is 6 miles in diameter and encloses two islands. The coral reef does not completely enclose the lagoon; there is a natural opening on the west side and another opening has been dredged on the south side. The reef rises abruptly from deep water and there are no offlying rocks or shoals; breakers mark all seaward sides of the reef. The enclosed islands have been leveled off to maximum heights of 12 feet. Numerous birds, especially albatross, nest on the islands and are sometimes a hazard to landing or departing airplanes.

The Midway Islands are within a naval defensive sea area and are not a part of Hawaii State. The establishing Executive order of February 14, 1941, says of Midway Islands:

The territorial waters between the extreme high-water marks in the 3-mile marine boundaries surrounding Midway Islands, in the Pacific Ocean, are hereby established and reserved as naval defensive sea area for purposes of national defense.

At no time shall any person, other than persons on public vessels of the United States, enter any of the naval defensive sea areas herein set apart and reserved, nor shall any vessel or other craft, other than public vessels of the United States, be navigated into any of said areas, unless authorized by the Secretary of the Navy.

Eastern Island, at the southeast end of the atoll, is triangular in shape, about 1.2 miles long, 6 to 12 feet high, and covered with trees, shrubbery, and course grass. Prominent from seaward are the high towers on the southeastern side of the island and a large rectangular-shaped building on the northwestern side. A dredged channel leads from westward to a basin on the northwestern side of the island.

Sand Island, on the southerly side of the atoll, is about 2 miles long in a northwesterly direction, and is composed of white coral sand. Prominent from offshore are the towers, tanks, and radio masts of the naval installations and a group of trees on the north side of the island. An aero light is in the north central part of the island.

Welles Harbor is the area inside the gap in the barrier reef on the west side of the atoll. The harbor was formerly used to a considerable extent as an anchorage by ships calling at Midway, but since the dredging of the ship channel and harbor between Sand and Eastern Islands, Welles Harbor is little used. Navigation in this area should not be attempted without local knowledge. The harbor is safe during the summer when the northeast trades blow steadily, but from October to April when gales are frequent with a rough westerly sea, the bar across the entrance breaks almost constantly. It is reported that vessels of not over 14-foot draft may cross the bar into Welles Harbor during smooth weather. There are no navigational aids and anchorage is not tenable in moderate to fresh winds. A depth of 6 feet may be taken from Welles Harbor to the main anchorage basin if a constant watch is maintained for coral heads.

Channels.—The dredged channel through the south reef leads to a basin on the east side of Sand Island, to a mooring basin northeast of Sand Island, and to the Eastern Island side channel. Entrance depth was 37 feet in 1958 but probably has been changed by shifting sands; **consult Naval authorities for latest controlling depths.** Entrance-channel markers include lighted and unlighted buoys and a **000° lighted range**; the Eastern Island channel is marked by buoys and by a **102° lighted range.**

Anchorages.—The established anchorage area is northeast of Sand Island. Outside anchorage is available in depths of 15 to 25 fathoms east of the main-channel sea buoy; this anchorage is fair during northeasterly winds but should not be attempted during winds from other quadrants. Anchorage south of Sand Island is prohibited to avoid possible fouling of the San Francisco-Honolulu-Midway-Guam-Manila cable.

Routes.—Vessels approaching Midway Islands are warned that the islands and surrounding waters out to the 3-mile limit are restricted. In approaching from any direction vessels will remain 3 miles off until south of the entrance. They should then steer a northerly course heading directly between Sand and Eastern Islands until the channel is made out, then steer on the range. Due to the prevailing easterly winds and westerly set of current, caution must be exercised in entering. Drift and leeway should be anticipated and sufficient speed should be maintained at all times to control the vessel. See discussion of currents in the channel.

Tides.—The diurnal range of tide is 1.2 feet at Midway Islands. The generally calm waters inside the reef are occasionally subjected to strong surge and they can be extremely agitated by winter gales.

Currents.—The current off the main entrance channel usually sets to the westward, and is normally 0.2 to 1 knot. At the channel entrance the current sets southeastward, while in the channel it sets southward with a velocity of 2 to 6 knots. There is generally little current in Welles Harbor and it usually sets westward; it is reported that during heavy gales the harbor is full of strong currents caused by the sea being forced over the reefs.

Weather.—During the summer months the winds are generally variable and light, either from northeast, southeast, or southwest until about the middle of July, when fresh to strong northeast trades set in, continuing through July and August. Southwest winds are always accompanied with a low barometer, rain, and squalls. Rain also comes occasionally with northeast and southeast winds and a high barometer. Northwest winds following southwest storms generally indicate clearing weather.

During the winter months from October to April, gales frequently occur, working around from southeast through southwest to northwest. Occasionally a few days of fine weather will prevail but a rough westerly sea is always present.

Harbor regulations.—Vessels approaching Midway identify themselves with the Naval station signal tower, Sand Island. All vessels must await positive permission from the tower to enter or leave the harbor. Entry is prohibited during the hours of darkness. Pilots will board incoming vessels south of the entrance. No vessel except those operating locally from Midway will enter the channel without pilots.

The following harbor control signals are displayed from the Naval station signal tower on Sand Island:

One ball.—Channel open for entering.

One cone, point up.—Channel open for leaving.

One ball over a cone, point up.—Channel closed.

Two cones, points together.—Channel open for two-way traffic.

Wharves.—At the northeastern end of Sand Island are two piers which have fuel and water connections, with depths of 36 feet alongside. In the submarine basin on the east side of Sand Island is a pier with a depth of 30 feet alongside. There is also a small-boat pier in the basin on the northwest side of Eastern Island. Twenty-ton mobile cranes, tugs, barges, and launches are available.

Supplies.—Provisions are available. Fuel oil, diesel oil, and water are not available for commercial use, except in case of emergency. Limited medical facilities are available.

Repairs.—Repairs can be made to small vessels.

Communications.—Telephone, teletype, radio, and cable systems are operated.

Chart 4185.—Unsurveyed **Nero Bank**, with a least known depth of 62 fathoms, is about 30 miles west-southwestward from Midway Islands. Westward from Nero Bank is **Pogy Bank**, also unsurveyed and with a least known depth of 41 fathoms.

Chart 4177.—Kure Island (28°25′ N., 178°20′ W.) is 50 miles west-northwestward of Midway Islands which it closely resembles both in formation and appearance. The Kure atoll is 4.5 miles in diameter, and a nearly continuous coral reef encloses a lagoon in which reefs and coral heads alternate with deep water. A mile-wide break in the southwest side of the barrier reef provides an entrance of sorts to the lagoon.

Green Island, on the southeastern side of the barrier reef, has a highest elevation of 20 feet; a tall, skeleton tower stands on the northeastern part of the island. West of Green Island are several small islets, largest of which is 10-foot-high **Sand Island**. The chart indicates possible landing on Green Island through a break in the reef at the southwest end; depths off landing are 5 to 6 feet between small coral heads and ledges.

The best anchorage is on the westerly side, near the northwesterly point of the breakers, in depths of 8 to 12 fathoms, rocky bottom. Vessels have anchored about 0.5 mile south-southwest of the south tip of Green Island in depths of 15 fathoms, sand and coral bottom. A bank with depths of 20 to 30 fathoms surrounds Kure Island. No dangers have been observed outside the reef. From the appearance of the islands, it may be assumed that they are sometimes visited by severe storms, the sand being thrown into numerous cones and pyramids.

Currents.—A set to the southward has been observed between Kure Island and Midway Islands. In the vicinity of Kure Island a continuous eastward current of about 2 knots during westerly weather has been reported.

Chart 4183.—Bensaleux Reef (26°18′ N., 178°44′ W.), was reported in 1920 by the master of the American steamer BENSALEUX to be about 127 miles southward of Kure Island. Breakers appeared to be about 0.5 mile in extent in an east-west direction and indicated the existence of a reef. About 65 miles southeast of Bensaleux Reef, breakers were observed in latitude 25°23′ N., longitude 178°04′ W., by the American Steamer ETHAN ALLEN in 1923. The master reported that the swell appeared to mount up and occasionally break as though over a shoal extending for about 2 or 3 miles in an east-west direction.

Johnston Island, Schjetman Reef, Wilder Shoal, Kingman Reef, and Palmyra Island.—Descriptions of these outlying Pacific areas have been transferred from United States Coast Pilot 7 to the U.S. Navy's H.O. Publication No. 80, Sailing Directions for the Pacific Islands, Volume III, Eastern Groups.

APPENDIX

COAST AND GEODETIC SURVEY.—United States Coast Pilots, Tide Tables, Tidal Current Tables, and Tidal Current Charts: For sale by U.S. Coast and Geodetic Survey, Washington, D.C., 20230, and its district offices and sales agencies which are listed semiannually in the Notice to Mariners.

United States Coast Pilots:

1, Atlantic Coast, Eastport to Cape Cod, 1960.
2, Atlantic Coast, Cape Cod to Sandy Hook, 1960.
3, Atlantic Coast, Sandy Hook to Cape Henry, 1961.
4, Atlantic Coast, Cape Henry to Key West, 1959.
5, Atlantic Coast—Gulf of Mexico, Puerto Rico, and Virgin Islands, 1962.
7, Pacific Coast—California, Oregon, Washington and Hawaii, 1963.
8, Pacific Coast, Alaska—Dixon Entrance to Cape Spencer, 1962.
9, Alaska, Cape Spencer to Arctic Ocean, 1954.
Distances Between United States Ports, Third (1961) Edition.

A Coast Pilot for which a supplement has been issued should not be used except with reference to the latest issue of its supplement. Supplements may be obtained from the U.S. Coast and Geodetic Survey, Washington, D.C., 20230, or any of its district offices.

Tide Tables:

Europe and West Coast of Africa.
East Coast, North and South America.
West Coast, North and South America.
Central and Western Pacific Ocean and Indian Ocean.

Tidal Current Tables:

Atlantic Coast, North America.
Pacific Coast, North America and Asia.

Tidal Current Charts:

Boston Harbor.
Narragansett Bay to Nantucket Sound.
Narragansett Bay.
Long Island Sound and Block Island Sound.
New York Harbor.
Delaware Bay and River.
San Francisco Bay.
Puget Sound, Northern Part.
Puget Sound, Southern Part.

District Offices.—Los Angeles District, 535 Subway Terminal Building, 417 South Hill St., Los Angeles 13, Calif. The Los Angeles District includes all of the State of Arizona; Clark County, Nev., and the following counties of California: San Bernardino, Kern, Santa Barbara, Ventura, Los Angeles, Orange, Riverside, San Diego, and Imperial.

San Francisco District, Room 121, Customhouse, San Francisco 26, Calif. The district includes all the State of Utah, and the parts of Nevada and California not assigned to the Los Angeles District.

Portland District, Room 314, U.S. Courthouse, Portland 5, Oreg. The district includes all the States of Montana, Idaho, and Oregon; and the following counties of Washington adjacent to the Columbia and Snake Rivers: Wahkiakum, Cowlitz, Clark, Skamania, Klickitat, Benton, Franklin, Walla Walla, Columbia, Garfield and Asotin.

Seattle District, Room 705, Federal Office Building, Seattle 4, Wash. The district includes the State of Washington except for those counties assigned to the Portland District, and the State of Alaska.

Honolulu District, Room 244, Federal Office Building, Honolulu 12, Hawaii. The district includes the State of Hawaii and the U.S.-owned Pacific Islands, as well as those administered under the United Nations mandate.

Coast and Geodetic Survey Sales Agents.—Agents marked with an (*) asterisk also handle certain U.S. Naval Oceanographic Office publications, and those marked with a (†) dagger also handle certain U.S. Coast Guard publications.

California:

Alameda: Pacific Marina Chandlery, Pacific Marina.
Arcadia: The Brown Shop, 49 East Huntington Drive.
Berkeley: Brennan Supply Co., 805 University Ave.
Bethel Island: Trogan Delta Boat Sales, Inc.
Bodega: McCaughey Bros.
Crescent City: Nielsen Hardware & Electric Co., Third and Eye Sts.
Eureka: †C.O. Lincoln & Co., 615 Fifth St.
Fairfield: Glenn & Red's Bait Shop, 1461 West Texas St.
Long Beach: B & B Supply Co., 1845 West Anaheim St.; Bahia Marine Hardware, 6200 East Pacific Coast Highway; *Long Beach Marine Hardware, 251 Marina Drive.
Los Angeles: C&GS, 535 Subway Terminal Bldg., 417 South Hill St.; Airport Marina, 5901 West Century; California Map Centre, 1100 South Hope St.
Lynwood: Pacific Coast Map Service, 12021 Long Beach Blvd.
Monterey. †Cincotta Brothers, 203 Alvarado St.

Morro Bay: Hortons, P.O. Box 635.
Moss Landing: Moss Landing Marine Supply, P.O. Box 55.
Newport Beach: Balboa Marine Hardware Co., 2537 West Coast Highway; *Newport Supply Co., 2700 West Coast Highway; *†South Coast Co., 23d at Central Ave.
North Hollywood: *†Pan-American Navigation Service, 12021 Ventura Blvd.
Oakland: Dick Peterson Co., 1363 Embarcadero.
Oxnard: Oxnard Sporting Goods, 235 West Fifth St.
Palo Alto: Glover Motor & Marine, 3705 El Camino Real.
Pittsburg: Seeno Bros. Boat Shop, 5 Cutter St.
Redondo Beach: Redondo Trading Post Co., 114 Diamond St.
Sacramento: A-1 Map Center, 3271 Folsom Blvd.; Ogden Surveying Equipment Co., 5520 Elvas Ave.
San Diego: *†Arey Jones Co., 933 Fourth St.; *†Nuttall-Styris Co., 825 Columbia St.
San Francisco: C&GS, 121 Customhouse; *†C. J. Hendry Co., 139 Townsend St.; *†George E. Butler, 356 California St.; *† San Francisco Instrument Co., 840 Battery St., Room 15.
San Pedro: *†C. J. Hendry Co., 111 S. Front St.; *†Globe Nautical Instrument Co., Inc., 261 West 7th St.; *†Marine Hardware Co., 34 South Beacon St.; *†Southwest Instrument Co., 235 West 7th St.
San Rafael: †Western Boat Shop, 101 Third St.
Santa Barbara: Seacoast Marine Corp., Breakwater.
Santa Monica: Yachtsmens Mart, 8921 Main St.
Sausalito: †Bauman Bros. & Dick Miller, Sausalito Yacht Harbor.
Stockton: Morris Bros., 15–17 North Hunter St.
Tahoe City: Tahoe Boat Co.
Tiburon: Tiburon Hardware & Marine, 1650 Tiburon Blvd.
Vallejo: Vallejo Boat Center, 823 Wilson Ave.
Venice: Jeffries Marine Supply Store, 4241 Lincoln Blvd.
Ventura: County Stationers, Inc., 532 East Main; *Seacoast Marine Corp., 6541 Ventura Blvd.

Oregon:

Astoria: Englund Marine Supply Co., Foot of 15th St.
Coos Bay: Independent Stevedore Co., Inc.
Newport: †Andy Smith Marine Supplies, 252 Bay Blvd.
North Bend: Oregon-Pacific Co., Inc.
North Portland: Columbia Marine Electronics, Kai's Boat Harbor.
Portland: †C&GS, Room 314 U.S. Court House Bldg., 620 S.W. Main St.; Eighty Second St. Marine, 2815 S.E. 82d St.; *†Frank H. Parks, 414 S.W. 3d Ave.; Portland Precision Instrument & Repair Co., 331 S.W. 4th Ave.

Washington:

Anacortes: †Marine Supply & Hardware; †Transmission Supply, 902 Commercial St.
Bellingham: Griggs Stationery & Printing Co., 120 East Holly St.
Bremerton: Bremerton Marine Supply, Inc., 1234 Charleston Beach.
Coulee Dam: Coulee Dam Nature & History Association.
Everett: Black & King, 2944 Colby Ave.; Robinson Marina, 19th & Norton St.
Friday Harbor: †Friday Harbor Drug Co.
Hoquiam: Industrial & Marine Supply Co., 701 Levee St.
Kelso: Cowlitz Marina, 85 Catlin St.
Neah Bay: Washburn's General Merchandise.
Oak Harbor: Chuck Dann's Sporting Goods, Inc., 1150 W. Pioneer Way.
Olympia: Capitol Towing & Marina, Columbia & B St.
Port Angeles: †Willson Hardware Co., 111 West First St.
Seattle: C&GS, 705 Federal Office Bldg.; Chartmaster Co., 8306 16th St., N.W.; *†Max Kuner Co., 1324 Second Ave.; *†Metsker Maps, 1020 Third Ave.; *†Northwest Instrument Co., 1403 West 45th St.; †Shrock the Compass Adjuster, 1117 East Northlake Ave.; *†Shrock the Compass Adjuster, Fisherman's Dock.
Tacoma: *†Metsker Maps, 111 South Tenth St.
Wallula: Kelly's Marine Supply, The Wallula Junction.

British Columbia:

Vancouver: *†Bovey Marine 1952, 1117 W. Pender St.; *Frederick Goertz, Ltd., 1328 West Pender St.; *Kelvin Hughes Div. S. Smith & Sons (Canada) Ltd., 1790 W. Georgia St.; *Western Marine Supply Co., Ltd. 528 Powell St.
Victoria: *Ship Chandlers (McQuades) Ltd., 1252 Wharf St.

Hawaii:

Honolulu: Coast and Geodetic Survey Office, Federal Office Bldg.; †McWayne Marine Supply Ltd., 1115 Ala Moana Blvd.
Kailua-Kona: KonaMar, Inc.

PUBLICATIONS.—A résumé of the U.S. Government publications of navigational value is included for the ready reference of the mariner. In addition to the agents located in the principal seaports handling sales publications, certain libraries have been designated by the Congress of the United States to receive the publications as issued for public review.

Nautical Charts.—Coasts of the United States and Possessions: published by U.S. Coast and Geodetic Survey; for sale by C&GS and its sales agents.

Mississippi River (Cairo, Ill., to Gulf of Mexico): Published and for sale by Mississippi River Commission, Vicksburg, Miss.

Mississippi River (Cairo, Ill., to Minneapolis, Minn.) and Illinois Waterway (Mississippi River to Lake Michigan): published and for sale by U.S. Army Engineer District, Chicago, Ill.

Great Lakes, Lake Champlain, New York State Canals, and the St. Lawrence River-St. Regis to Cornwall, Canada: Published and for sale by U.S. Lake Survey, Detroit, Mich.

Foreign countries: Published by U.S. Naval Oceanographic Office; for sale by that office and its sales agents.

Coast Pilots.—Coasts of the United States and Possessions: Published by U.S. Coast and Geodetic Survey; for sale by C&GS and its sales agents.

Great Lakes Pilot published and for sale by U.S. Lake Survey, Detroit, Mich.

Foreign countries (Sailing Directions): Published by U.S. Naval Oceanographic Office; for sale by that office and its sales agents.

Tide and Tidal Current Tables, and Tidal Current Charts.—Published by U.S. Coast and Geodetic Survey; for sale by C&GS and its sales agents.

Notices to Mariners may be obtained free from the following: Local Notices to Mariners—District Commander of the local Coast Guard district; Weekly Notice to Mariners, Part I (Atlantic Coast and Mediterranean) and Part II (Pacific and Indian Oceans)—U.S. Naval Oceanographic Office; Weekly Notice to Mariners, Great Lakes—Commander, Ninth Coast Guard District, Cleveland, Ohio.

Light Lists.—United States and Possessions: Published by U.S. Coast Guard; for sale by the Superintendent of Documents and his sales agents.

Foreign countries: Published by U.S. Naval Oceanographic Office; for sale by that office and its sales agents.

Radio.—Radio Navigational Aids, Atlantic and Mediterranean Area (H.O. Pub. No. 117A); Radio Navigational Aids, Pacific and Indian Oceans Area (H.O. Pub. No. 117B); Radio Weather Aids (H.O. Pub. No. 118); Weather Station Index (H.O. Pub. No. 119); and International Code of Signals, Vol. II—Radio (H.O. Pub. No. 104): Published by U.S. Naval Oceanographic Office; for sale by that office and its sales agents.

Miscellaneous.—The Nautical Almanac, and American Ephemeris and Nautical Almanac: Published by United States Naval Observatory; for sale by Superintendent of Documents and his sales agents.

American Practical Navigator (Bowditch) (H.O. Publication No. 9), and International Code of Signals, Volume I—Visual (H.O. Publication No. 103): Published by U.S. Naval Oceanographic Office; for sale by that office and its sales agents.

Rules of the Road, International—Inland (CG-169). Rules of the Road, Western Rivers (CG-184). Rules of the Road, Great Lakes (CG-172): Published by and free on application to the U.S. Coast Guard.

Port Series of the United States: Part I (port administration and services) published by Maritime Administration, U.S. Department of Commerce; Part II (port conditions and facilities) published by Corps of Engineers, U.S. Army. Both parts are for sale by the Superintendent of Documents.

CORPS OF ENGINEERS, U.S. ARMY.—District offices and areas covered by this Coast Pilot follow:

Los Angeles District, 751 South Figueroa Street, Los Angeles 17, Calif. Coastal waters and tributaries of California from the Mexican boundary to Cape San Martin (35°54′ N., 121°27′ W.).

San Francisco District, 180 New Montgomery Street, San Francisco 19, Calif. Coastal waters and tributaries of California from Cape San Martin to the Oregon boundary, including San Francisco Bay but not Suisun Bay and the Sacramento and San Joaquin Rivers and their tributaries.

Sacramento District, 650 Capitol Avenue, Federal and Courts Building, Sacramento, Calif. Suisun Bay, and the Sacramento and San Joaquin Rivers and their tributaries.

Portland District, 628 Pittock Block, Southwest 10th Avenue and Washington Street, Portland 5, Oreg. Coastal waters and tributaries of Oregon, and the waters and tributaries of Columbia River as far as the John Day damsite.

Walla Walla District, Building 602, City-County Airport, Walla Walla, Wash. Columbia River and tributaries above the John Day damsite.

Seattle District, 1519 South Alaskan Way, Seattle 4, Wash. Coastal waters and tributaries of Washington except Columbia River.

Honolulu District, Building 96, Fort Armstrong, Honolulu, Hawaii. The State of Hawaii; Line, Gilbert, Marshall, Midway, Wake, and Johnston Islands; and such islands in the South Pacific Ocean lying between the 159th meridian of east longitude and 108th meridian of west longitude as may be under the jurisdiction of the United States.

COAST GUARD.—District offices and areas covered by this Coast Pilot follow:

Commander, 11th Coast Guard District, 706 Times Building, Long Beach 2, Calif. Coastal waters and tributaries in California south of 34°58′ N.

San Diego Captain of the Port, Coast Guard Air Station, 2710 Harbor Drive, San Diego 12, Calif.

Los Angeles Captain of the Port, P.O. Box 1251, Long Beach, Calif.

Commander, 12th Coast Guard District, 630 Sansome Street, San Francisco 26, Calif. Coastal waters and tributaries in California north of 34°58′ N.

San Francisco Captain of the Port, Pier 45½, San Francisco 11, Calif.

Commander, 13th Coast Guard District, 618 Second Avenue, Seattle 4, Wash. Coastal waters and tributaries in Oregon, Washington, and Idaho.

Portland Captain of the Port, 208 S.W. 5th Avenue, Portland 12, Oreg.

Seattle Captain of the Port, Pier 39, 1519 S. Alaskan Way, Seattle 1, Wash.

Commander, 14th Coast Guard District, 1347 Kapiolani Boulevard, Honolulu, Hawaii. Hawaii and the Pacific Islands belonging to the United States west of 140° W. and south of 42° N.

Honolulu Captain of the Port, Pier 11, Honolulu, Hawaii.

Lifeboat Stations.—The lifeboat stations operated by the Coast Guard on the Pacific coast are:

Monterey, Calif. (No. 308), 36°36.5′ N., 121°53.7′ W. At the foot of Monterey Breakwater.

Fort Point, Calif. (No. 310), 37°48.3′ N., 122°28.0′ W. On Presidio, near south tower of Golden Gate Bridge.

Point Reyes, Calif. (No. 313), 37°59.6′ N., 122°58.3′ W. Drakes Bay, 2.3 miles east of Point Reyes Light.

Humboldt Bay, Calif. (No. 316), 40°46.0′ N., 124°13.0′ W. East side of North Spit at entrance to Humboldt Bay.

Port Orford, Oreg. (No. 318), 42°44.3′ N., 124°30.5′ W. At head of Nellies Cove.

Coos Bay, Oreg (No. 320), 43°20.9′ N., 124°19.8′ W. South side of entrance to Coos Bay, about 0.3 mile east of Coos Head.

Umpqua River, Oreg. (No. 321), 43°39.9′ N., 124°11.9′ W. About 350 yards north of Umpqua River Light.

Yaquina Bay, Oreg. (No. 323), 44°37.6′ N., 124°03.3′ W. Newport waterfront, north side of bay, near bridge.

Tillamook Bay, Oreg. (No. 325), 45°33.5′ N., 123°55.2′ W. North shore at Garibaldi.

Point Adams, Oreg. (No. 326), 46°12.0′ N., 123°56.8′ W. At Hammond.

Cape Disappointment, Wash. (No. 327), 46°16.8′ N., 124°02.7′ W. At Fort Canby on southwest side of Baker Bay.

Willapa Bay, Wash. (No. 329), 46°42.4′ N., 124°58.0′ W. At end of Toke Point.

Grays Harbor, Wash. (No. 330), 46°54.5′ N., 124°06.6′ W. On west side of Westhaven Harbor.

Quillayute River, Wash. (No. 331), 47°54.5′ N., 124°38.2′ W. At La Push.

Neah Bay, Wash. (No. 332), 48°22.3′ N., 124°35.8′ W. About 0.5 mile southward of Waada Island.

CUSTOMS DISTRICTS.—The first-named ports in the following list are the headquarters ports. An asterisk (*) precedes the names of ports authorized to issue marine documents.

San Diego District: The limits are the counties of San Diego and Imperial in the State of California.

Port of entry: *San Diego.

Los Angeles District: The limits are that part of the State of California lying south of the northern boundaries of the counties of San Luis Obispo, Kern, and San Bernardino, except the counties of San Diego and Imperial.

Ports of entry: *Los Angeles, Port San Luis.

San Francisco District: The limits are that part of the State of California lying north of the northern boundaries of the counties of San Luis Obispo, Kern, and San Bernardino.

Ports of entry: *San Francisco-Oakland (including all points on San Francisco Bay); *Eureka.

Oregon District: The limits are the State of Oregon and that part of the State of Washington which embraces the waters of Columbia River and the north bank of said river west of 119° W.

Ports of entry: *Portland, *Astoria, *Coos Bay, Longview, Newport.

Washington District: The limits are the State of Washington except that part which embraces the waters of the Columbia River and the north bank of the said river west of 119° W.

Ports of entry: *Seattle, *Aberdeen, Anacortes, *Belingham, Blaine, Everett, Friday Harbor, Neah Bay, Northport, Olympia, *Port Angeles, *Port Townsend, *Tacoma, South Bend-Raymond.

Hawaii District: The limits include all of Hawaii.

Ports of entry: *Honolulu, Hilo, Kahului, Port Allen.

PUBLIC HEALTH SERVICE.—Quarantine Stations where supervision of quarantine and medical examination of aliens are performed:

San Diego: Medical Officer in charge, Quarantine Station, Shelter Island, San Diego 6, Calif.

San Pedro: Medical Officer in charge, Terminal Island, P.O. Box 97, San Pedro, Calif.

San Francisco: Medical Officer in charge, 3015 Ferry Bldg., San Francisco 11, Calif.

Seattle: Medical Officer in charge, 33 Federal Building, Seattle 4, Wash.

Honolulu: Medical Officer in charge, P.O. Box 1410, Honolulu, Hawaii.

Portland: 221 U.S. Courthouse Building, Portland 5, Oreg., is an additional office from which quarantine services are performed.

Hospitals:

San Francisco: 15th Avenue and Lake Street, San Francisco 18, Calif.

Seattle: 1131 14th Avenue, South, Seattle 14, Wash.

Outpatient Clinics:

San Diego: 208 New Post Office Building, San Diego 1, Calif.

San Pedro: 314 Federal Building, 825 South Beacon Street, San Pedro, Calif.

Los Angeles: 424 Federal Building, 312 North Spring Street, Los Angeles 12, Calif.

Portland: 220 U.S. Courthouse, Broadway and Main Streets, Portland 5, Oreg.

Honolulu: 208 Federal Building, Honolulu 7, Hawaii.

Outpatient Offices:

Eureka, Calif.: Medical-Dental Building, 730 Seventh Street.

Astoria, Oreg.: 486 12th Street.

Coos Bay, Oreg.: 510 Hall Building, 320 West Central Avenue.

Newport, Oreg.: 625 South Hubert Street.

Aberdeen, Wash.: 700 Becker Building, 110 South First Street.

Anacortes, Wash.: 1302 8th St.

Bellingham, Wash.: G-19 Bellingham Medical Center, 18 C St.

Everett, Wash.: 3202 Colby Avenue.

Olympia, Wash.: 529 West Fourth Street.

Port Angeles, Wash.: 926 Caroline St.

Port Townsend, Wash.: 1136 Water Street.

IMMIGRATION and NATURALIZATION.—Offices of these services are in the following places:

California:

San Diego: Lindbergh Field.
Los Angeles: 510 S. Vermont Ave.
San Pedro: Terminal Island.
San Luis Obispo: 793 Higuerra St.
San Francisco: Appraisers Bldg., 630 Sansome St.
Sacramento: Federal and U.S. Courthouse Bldg., 650 Capitol Ave.

Oregon:

Portland: 333 U.S. Courthouse Bldg., Broadway and Main Sts.

Washington:

Aberdeen: U.S. Post Office Bldg., 2d and G Sts.
Anacortes: 202 Burton Bldg., 2d and Commercial Sts.
Bellingham: U.S. Post Office Bldg., Magnolia and Cornwall Sts.
Port Angeles: U.S. Post Office Bldg., First and Oak Sts.
Seattle: 815 Airport Way.
Tacoma: U.S. Post Office Bldg., 11th and A Sts.

Hawaii:

Honolulu: Ala Moana Blvd.

FEDERAL COMMUNICATIONS COMMISSION.—District field offices:

Los Angeles: 849 S. Broadway, Los Angeles 12, Calif.
San Francisco: Room 323A, U.S. Customhouse, 555 Battery Street, San Francisco 26, Calif.
Portland: Room 507. New U.S. Courthouse Building, 620 Southwest Main Street, Portland 5, Oreg.
Seattle: Room 802, Federal Office Building, Seattle 4, Wash.
Honolulu: Room 502, Federal Building, Honolulu 1, Hawaii.

WEATHER BUREAU.—Offices: In the area covered by this Coast Pilot, the Weather Bureau operates a marine center from which personnel will visit ships to compare barometers and other weather instruments, and at other Weather Bureau offices barometers may be brought in for comparison with standards, as follows:

Marine center:

San Francisco, Calif.. Room 216, U.S. Customhouse, 555 Battery St.

Comparison offices:

San Diego, Calif.: Lindbergh Field.
Long Beach, Calif.: Pier A, Berth 9.
Los Angeles, Calif.: International Airport.
Oakland, Calif.: Oakland Municipal Airport.
Eureka, Calif.: Weather Bureau Office.
Astoria, Oreg.: Clatsop County Airport.
Portland, Oreg.: Airport Station.
Seattle, Wash.: Room 703, Federal Office Bldg.
Honolulu, Hawaii: Weather Bureau Office, Pier 2.

Radiotelephone broadcasts by Coast Guard.—Scheduled marine information broadcasts of notices to mariners, hydrographic information, storm warnings, small-craft warnings, advisories, and other important marine information are broadcast by radiotelephone at the scheduled times and indicated frequencies preceded by an initial call on 2182 kc. Urgent and safety broadcasts are made on 2182 kc. upon receipt.

NMQ, Long Beach, Calif., 2670 kc., 0500 and 1700 GMT.
NMC, San Francisco, Calif., 2670 kc., 0430 and 1630 GMT.
NMW, Westport, Wash., 2670 kc., 0530 and 1730 GMT.
NOW, Port Angeles, Wash., 2670 kc., 0545 and 1745 GMT.
NMW43, Seattle, Wash., 2670 kc., 1715 GMT.
NMO, Honolulu, Hawaii, 2670 kc., 0600 and 1800 GMT.

Radiotelegraph broadcasts by Coast Guard.—Scheduled marine information broadcasts of notices to mariners, hydrographic information, forecasts, reports, storm warmings, advisories, and other important marine information are broadcast by radiotelegraph at the scheduled times and indicated frequencies, preceded by an initial call on 500 kc. Urgent broadcasts are made on 500 kc. upon receipt and repeated during the last 15 seconds of the first silent period after receipt. Whenever this transmission occurs outside the watch hours for single radio-operator ships, the message will be repeated at the end of the next silent period falling within the radio watch hours for such vessels. Urgent broadcasts are preceded by the Urgent Signal (XXX).

NMQ, Long Beach, Calif., 472 kc., 0420 and 1720 GMT.
NMC, San Francisco, Calif., 486 kc., 0400 and 1700 GMT.
NMW, Westport, Wash., 440 kc., 0430 and 1700 GMT.
NMO, Honolulu, Hawaii, 440 kc., 0530 and 2000 GMT.

Weather broadcasts by commercial radio stations.—Taped or direct broadcasts of forecasts and storm warnings are made by commercial radio stations in the areas covered by this Coast Pilot. These usually are made several times daily; broadcast times are published in local newspaper radio program schedules, and in the Coastal Warning Facilities Charts issued annually by the U.S. Weather Bureau. The charts are on sale, 10 cents each, by Superintendent of Documents, Washington, D.C., 20402.

STORM WARNING STATIONS.—Weather Bureau listing of display stations in the area covered by this Coast Pilot follow. **DN** indicates day and night display; **D,** day display only; **W,** no display, posted warnings only; **(S)** seasonal display only.

California:

DN Cabrillo National Monument; 32°40.3′, 117°14.4′.
D Coronado Yacht Club; 32°40.8′, 117°10.5′.
DN San Diego, Shelter Island; 32°42.5′, 117°14.0′.
DN San Diego, Municipal Pier No. 2; 32°43.0′, 117°10.5′.
DN Mission Beach; 32°45.6′, 117°14.8′.
DN Avalon, pleasure pier; 33°20.6′, 118°19.5′.
DN Newport Beach Harbor; 33°36.2′, 117°53.0′.
DN Los Angeles Light; 33°42.5′, 118°15.0′.
DN San Pedro; 33°43.2′, 118°16.2′.
D Los Angeles, Terminal Island; 33°43.9′, 118°15.8′.
DN Long Beach; 33°44.9′, 118°12.9′.
DN Long Beach Marina; 33°45.0′, 118°06.8′.
D Los Angeles, Wilmington; 33°46.0′, 118°15.0′.
D Redondo Beach; 30°50.8′, 118°23.7′.
DN Marina del Rey; 33°58.2′, 118°26.8′.
DN Santa Monica Pier; 34°00.5′, 118°30.0 .
DN Port Hueneme; 34°09.0′, 119°12.0′.
DN Santa Barbara; 34°24.2′, 119°41.5′.
D Port San Luis; 35°10.7′, 120°44.0′.
D Morro Bay; 35°21.9′, 120°51.1′.
DN Monterey Lifeboat Station; 36°36.5′, 121°53.7′.
D Palo Alto Yacht Harbor; 37°27.4′, 122°06.5′.
D San Francisco Lightship; 37°45.0′, 122°41.5′.
D Oakland Harbor Light Station; 37°48.0′, 122°19.8′.
DN San Francisco, Telephone Bldg.; 37°47.2′, 122°24.0′.
D San Francisco, Pier 45D; 37°48.7′, 122°25.2′.
D Sausalito; 37°51.2′, 122°28.7′.
D Berkeley Yacht Harbor; 37°52.0′, 122°19.0′.
D San Joaquin River, Antioch Bridge; 38°01.2′, 121°45.2′.
D Brokerage Wharf, Bethel Island; 38°00.8′, 121°38.4′.
W Fort Bragg; 39°26.5′, 123°48.0′.
D Blunts Reef Lightship; 40°26.4′, 124°30.2′.
DN Humboldt Bay Lifeboat Station; 40°46.2′, 124°13.0′.
D Eureka; 40°48.3′, 124°10.3′.

Oregon:

D Chetco River, Port of Brookings; 42°02.7′, 124°16.1′.
DN Cape Arago Light Station; 43°20.5′, 124°22.5′.
DN Charleston, small-boat basin; 43°20.8′, 124°19.4′.
D Coos Head Lookout; 43°21.1′, 124°20.1′.
DN Umpqua River Lifeboat Station; 43°40.0′, 124°12.0′
D Florence; 43°58.0′, 124°06.3′.
DN Yaquina Bay Lifeboat Station; 44°37.6′, 124°03.3′.
DN Yaquina Head Light Station; 44°40.6′, 124°04.7′.
D Winchester Bay; 43°40.7′, 124°10.4′.
D Depoe Bay, CG moorings; 44°48.6′, 124°03.5′.
D Tillamook Bay Lifeboat Station; 45°33.5′, 123°55.2′.
D Columbia River Lightship; 46°11.0′, 124°11.0′.
DN Point Adams Lifeboat Station; 46°12.0′, 123°56.7′.

Washington:

D Ilwaco; 46°18.4′, 124°02.2′ (S).
DN Tatoosh Island; 48°23.5′, 124°44.0′.
D Redondo; 47°20.9′, 122°19.4′.
DN South Bend; 46°40.4′, 123°46.7′.
DN Willapa Bay Lifeboat Station; 46°42.3′, 123°58.0′.
DN Grays Harbor Lifeboat Station; 46°54.6′, 124°07.0′.
D Tacoma, Narrows Marina; 47°14.7′, 122°33.4′.
D Tacoma, Pier 2; 47°16.6′, 122°24.7′.
D Tacoma, Point Defiance; 47°18.4′, 122°31.0′.
DN Seattle Yacht Club; 47°38.7′, 122°18.4′.
D Seattle, Leschi Park; 47°36.1′, 122°17.0′.
D Seattle, U.S. Locks; 47°40.0′, 122°23.7′.
D Quillayute River Lifeboat Station; 47°54.4′, 124° 38.0′.
D Umatilla Reef Lightship; 48°10.0′, 124°50.4′.
DN Neah Bay Lifeboat Station; 48°22.3′, 124°35.8′.
DN Port Angeles; 48°07.2′, 123°26.5′.
DN New Dungeness Light Station; 48°10.9′, 123°06.5′.
DN Everett City Dock; 47°58.8′, 122°13.2′.
DN Port Townsend; 48°07.1′, 122°45.3′.
DN Bellingham; 48°44.5′, 122°29.2′.
DN Blaine; 48°59.8′, 122°45.1′.

Hawaii:

D Upolu Point, Hawaii; 20°15.3′, 155°53.4′.
D Hilo, C.G. Moorings, Hawaii; 19°43.7′, 155°04.4′.
D Kailua, Hawaii; 19°38.6′, 156°00.0′.
D Mahukona, Hawaii; 20°11.3′, 155°54.3′.
D Hana, Maui; 20°45.6′, 155°59.1′.
D Maalaea, Maui; 20°47.7′, 156°30.8′.
D Lahaina, Maui; 20°52.5′, 156°40.9′.
D Kahului Harbor, Maui; 20°53.9′, 156°28.3′.
D Kaumalapau Harbor, Lanai; 20°47.3′, 156°59.5′.
D Kaunakakai, Molokai; 21°05.0′, 157°01.9′.
D Makapuu Point, Oahu; 21°18.8′, 157°39.2′.
D Honolulu, Ala Wai Yacht Harbor, Oahu; 21°17.4′, 157°50.6′.
D Honolulu, Kewalo Basin, Oahu; 21°17.7′, 157°51.4′.
D Honolulu, Aloha Tower, Oahu; 21°18.6′, 157°52.1′.
D Kaneohe, Mokapu Peninsula, Oahu; 21°26.5′, 157°46.0′.
D Kaneohe Yacht Club, Oahu; 21°25.1′, 157°46.3′.
D Nawiliwili Jetty, Kauai; 21°57.4′, 159°21.3′.

LEGAL HOLIDAYS.—In the areas covered by this Coast Pilot, the following holidays are observed throughout:

January 1, New Year's Day; February 22, Washington's Birthday; May 30, Memorial Day; July 4, Independence Day; first Monday in September, Labor Day; November 11, Veterans Day; fourth Thursday in November, Thanksgiving Day; December 25, Christmas Day.

In addition, Hawaii observes: March 26, Kuhio Day; Good Friday; and June 11, Kamehameha Day. California observes its Admission Day, September 9. California, Oregon, and Washington observe Lincoln's Birthday, February 12.

CLIMATOLOGICAL TABLES

These tables were compiled from U. S. Weather Bureau data.

Sky cover is expressed in a range of 0 for no clouds to 10 for complete sky cover. The number of clear days is based on average cloudiness of 0 to 3, partly cloudy days on 4 to 7, and cloudy days on 8 to 10.

Heavy fog includes data referred to at various times in the past as "Dense" or "Thick." The upper visibility limit for heavy fog is 1/4 mile.

(a) means length of record in years.
* means less than one-half.
T means trace, an amount too small to measure.

SAN DIEGO, CALIF. (Lindbergh Field) 32°44'N., 117°10'W. Elevation (ground) 13 feet. WB-1961

Month	Air temperature (°F.) Normal: Daily maximum	Daily minimum	Monthly	Extreme: Record highest	Record lowest	Precipitation (inches): Normal total	Maximum in 24 hrs.	Snow, sleet, mean total	Humidity (percent): 10:00 a.m. PST	4:00 p.m. PST	Wind (knots): Mean speed	Prevailing direction	Maximum speed and direction	Percent of possible sunshine	Mean sky cover sunrise to sunset	Mean number of days: Sunrise to sunset: Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, sleet 1.0 inch or more	Thunderstorms	Heavy fog
(a)				20	20		21	21	21	21	21	13	18	21	21	21	21	21	21	21	21	21
Jan.	64.3	45.5	54.9	88	29	1.69	2.65	T	57	59	4.8	NE	34 SW	68	5.0	13	7	11	7	0	*	4
Feb.	65.0	47.5	56.3	88	36	2.26	1.71	0.0	56	58	5.3	NE	30 SW	71	4.9	11	8	9	6	0	*	3
Mar.	66.5	49.8	58.2	88	41	1.52	2.40	0.0	57	58	5.9	WNW	40 SW	70	5.0	12	10	9	7	0	*	2
Apr.	67.8	53.1	60.5	92	41	0.83	1.22	0.0	61	60	6.3	WNW	32 S	61	5.5	9	10	11	5	0	*	2
May	69.6	56.7	63.2	96	48	0.26	0.42	0.0	62	62	6.5	WSW	23 SW	59	5.4	10	11	10	2	0	*	1
June	71.5	59.6	65.6	97	50	0.04	0.26	0.0	67	64	6.3	SSW	23 S	58	5.2	10	13	7	1	0	*	1
July	75.5	63.1	69.3	93	55	0.01	0.08	0.0	68	64	5.8	WNW	16 SW	67	4.4	13	14	4	*	0	*	1
Aug.	76.5	64.0	70.3	98	57	0.05	0.83	0.0	67	65	5.7	WNW	20 SW	68	4.2	15	12	4	*	0	*	1
Sep.	75.9	61.5	68.7	104	51	0.17	0.62	0.0	65	64	5.4	NW	22 W	69	3.7	17	9	4	1	0	*	4
Oct.	73.0	56.9	65.0	98	45	0.63	1.20	0.0	61	64	5.1	WNW	27 N	66	4.2	14	10	7	2	0	*	4
Nov.	70.9	50.6	60.8	96	40	0.83	2.44	0.0	52	59	4.6	NE	44 SE	75	3.7	16	8	6	4	0	*	5
Dec.	66.4	47.4	56.9	85	35	2.57	3.07	0.0	55	60	4.5	NE	30 S	70	4.6	14	8	9	6	0	*	5
Year	70.2	54.6	62.4	104	29	10.86	3.07	T	61	61	5.6	WNW	44 SE	67	4.7	154	120	91	42	0	3	33

LOS ANGELES, CALIF. (International Airport) 33°56'N., 118°23'W. Elevation (ground) 97 feet. WB-1961

Month	Air temperature (°F.) Normal: Daily maximum	Daily minimum	Monthly	Extreme: Record highest	Record lowest	Precipitation (inches): Normal total	Maximum in 24 hrs.	Snow, sleet, mean total	Humidity (percent): 10:00 a.m. PST	4:00 p.m. PST	Wind (knots): Mean speed	Prevailing direction	Maximum speed and direction	Percent of possible sunshine	Mean sky cover sunrise to sunset	Mean number of days: Sunrise to sunset: Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, sleet 1.0 inch or more	Thunderstorms	Heavy fog
(a)				2	2		26	26	2	2	13	26	12		13	26	26	26	26	26	19	29
Jan.	63.3	43.0	53.2	83	36	2.01	6.19	T	48	53	5.4	W	42 SW		5.3	12	8	11	7	0	*	6
Feb.	63.3	44.8	54.1	79	40	2.75	3.79	T	55	61	5.8	W	50 N		4.8	12	6	10	6	0	*	4
Mar.	65.2	47.8	56.5	82	42	1.91	2.36	0.0	65	67	6.3	W	54 W		5.1	12	8	11	5	0	*	5
Apr.	66.8	51.5	59.2	88	46	0.96	1.88	0.0	58	61	6.6	WSW	51 N		5.4	10	9	11	4	0	*	3
May	68.9	55.3	62.1	79	49	0.30	0.56	0.0	61	62	6.5	WSW	39 N		5.0	11	9	11	1	0	0	2
June	71.5	57.8	64.7	82	53	0.07	0.07	0.0	73	70	6.2	WSW	28 W		4.7	9	11	10	*	0	0	2
July	74.4	60.8	67.6	92	58	T	0.05	0.0	69	71	5.9	WSW	25 W		4.0	11	13	7	1	0	*	2
Aug.	75.0	61.3	68.2	83	59	0.02	0.21	0.0	73	74	5.8	WSW	29 SE		4.1	11	13	7	*	0	*	3
Sep.	74.6	58.7	66.7	101	57	0.21	4.20	0.0	66	68	5.4	WSW	23 SW		3.9	13	11	6	1	0	*	5
Oct.	72.3	54.5	63.4	106	46	0.43	1.21	0.0	58	66	5.2	W	40 N		4.3	13	10	8	2	0	*	6
Nov.	70.2	48.4	59.3	89	43	1.10	2.91	0.0	59	67	5.0	W	48 N		4.2	15	8	7	3	0	*	7
Dec.	65.9	45.3	55.6	88	38	2.61	3.01	0.0	57	67	5.0	W	43 S		4.6	12	9	10	6	0	*	7
Year	69.3	52.4	60.9	106	36	12.37	6.19	T	62	66	5.7	W	54 W		4.6	141	115	109	36	0	3	52

SAN FRANCISCO, CALIF. (International Airport) 37°37'N., 122°23'W. Elevation (ground) 8 feet. WB-1961

Month	Air temperature (°F.) Normal: Daily maximum	Daily minimum	Monthly	Extreme: Record highest	Record lowest	Precipitation (inches): Normal total	Maximum in 24 hrs.	Snow, sleet, mean total	Humidity (percent): 10:00 a.m. PST	4:00 p.m. PST	Wind (knots): Mean speed	Prevailing direction	Maximum speed and direction	Percent of possible sunshine	Mean sky cover sunrise to sunset	Mean number of days: Sunrise to sunset: Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, sleet 1.0 inch or more	Thunderstorms	Heavy fog
(a)				34	34		34	34	22	22	34	34	24		20	34	34	34	34	34	34	24
Jan.	55.8	39.9	47.9	72	24	3.47	2.07	T	78	69	6.0	WNW	52 SW		6.2	8	9	14	11	0	*	4
Feb.	58.9	42.6	50.8	78	25	3.44	2.31	T	75	68	7.4	WNW	54 SW		5.8	9	7	12	10	0	*	3
Mar.	61.3	44.2	52.8	85	30	2.44	2.11	T	69	66	8.9	WNW	45 NW		5.6	10	9	12	9	0	*	1
Apr.	62.8	45.4	54.1	88	31	1.29	2.66	0.0	69	68	10.4	WNW	42 W		5.2	11	10	9	6	0	*	*
May	65.3	47.8	56.6	94	36	0.40	1.54	0.0	67	67	11.5	W	49 W		4.7	13	10	8	3	0	*	*
June	68.9	50.4	59.7	106	41	0.13	0.49	0.0	66	65	12.3	W	42 W		3.7	17	8	5	1	0	*	*
July	69.2	51.5	60.4	104	43	0.01	0.15	0.0	69	66	12.0	NW	43 W		3.1	20	8	3	*	0	*	*
Aug.	69.6	51.6	60.6	92	42	0.01	0.21	0.0	70	68	11.2	NW	39 WNW		3.5	19	9	3	*	0	*	*
Sep.	72.2	51.7	62.0	102	38	0.11	2.30	0.0	68	63	9.6	NW	42 S		3.1	18	9	3	1	0	*	1
Oct.	69.4	49.3	59.4	95	34	0.92	1.57	0.0	69	64	8.0	WNW	44 SW		4.0	16	9	6	4	0	*	2
Nov.	64.1	44.7	54.4	84	25	1.62	1.63	0.0	72	65	6.0	WNW	48 SSW		5.1	12	9	9	6	0	*	3
Dec.	56.9	41.6	49.3	75	20	3.59	3.33	T	77	70	5.6	WNW	46 S		6.0	9	8	14	10	*	*	5
Year	64.5	46.7	55.6	106	20	17.43	3.33	T	71	67	9.0	WNW	54 SW		4.7	162	105	98	62	*	2	21

EUREKA, CALIF. (Post Office Building) 40°48'N., 124°10'W. Elevation (ground) 43 feet. WB-1961

Month	Air temperature (°F.) Normal: Daily maximum	Daily minimum	Monthly	Extreme: Record highest	Record lowest	Precipitation (inches): Normal total	Maximum in 24 hrs.	Snow, sleet, mean total	Humidity (percent)		Wind (knots): Mean speed	Prevailing direction	Maximum speed and direction	Percent of possible sunshine	Mean sky cover sunrise to sunset	Mean number of days: Sunrise to sunset: Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, sleet 1.0 inch or more	Thunderstorms	Heavy fog
(a)				51	51		51	51			51	51	51	51	19	51	51	51	51	51	51	51
Jan.	53.6	40.8	47.2	75	25	6.20	4.42	0.2			6.1	SE	47 S	40	7.3	6	6	19	17	*	1	4
Feb.	54.6	42.2	48.4	85	27	5.65	4.88	T			6.3	SE	42 SW	44	7.3	6	6	16	14	0	1	3
Mar.	55.0	43.2	49.1	78	29	4.64	3.09	T			6.6	N	42 SW	49	7.4	6	8	17	15	0	*	2
Apr.	56.0	45.2	50.6	79	32	2.88	2.38	T			7.0	N	43 N	53	7.2	6	9	15	12	0	*	2
May	57.7	48.1	52.9	84	37	1.82	2.23	0.0			6.9	N	35 NW	54	7.0	7	10	14	9	0	*	1
June	60.2	51.0	55.6	85	41	0.66	1.73	0.0			6.4	N	34 NW	57	6.4	8	10	12	5	0	*	2
July	60.6	52.2	56.4	76	45	0.09	1.18	0.0			5.9	NW	30 N	51	6.6	6	12	13	2	0	*	3
Aug.	61.3	52.7	57.0	73	44	0.11	0.89	0.0			5.0	NW	30 N	46	7.0	5	11	15	2	0	*	5
Sep.	61.5	50.9	56.2	85	41	0.67	1.18	0.0			4.8	N	38 N	52	5.9	9	9	12	5	0	*	7
Oct.	60.0	48.4	54.2	82	34	2.70	5.83	0.0			4.9	N	37 SW	48	6.5	9	8	14	9	0	*	9
Nov.	57.8	44.8	51.3	77	29	4.64	4.55	0.0			5.1	SE	37 S	42	7.1	7	7	16	12	0	1	7
Dec.	55.0	42.2	48.6	70	22	6.09	4.17	T			5.6	SE	49 S	39	7.5	6	7	18	15	0	1	4
Year	57.8	46.8	52.3	85	22	36.15	5.83	0.2			5.9	N	49 S	49	6.9	81	103	181	118	*	4	49

ASTORIA, OREG. (Clatsop County Airport) 46°09'N., 123°53'W. Elevation (ground) 8 feet. WB-1961

Month	Air temperature (°F.) Normal: Daily maximum	Daily minimum	Monthly	Extreme: Record highest	Record lowest	Precipitation (inches): Normal total	Maximum in 24 hrs.	Snow, sleet, mean total	Humidity (percent): 10:00 a.m. PST	4:00 p.m. PST	Wind (knots): Mean speed	Prevailing direction	Maximum speed and direction	Percent of possible sunshine	Mean sky cover sunrise to sunset	Mean number of days: Sunrise to sunset: Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, sleet 1.0 inch or more	Thunderstorms	Heavy fog
(a)				8	8		8	8	8	8	8	8			8	8	8	8	8	8	8	8
Jan.	44.0	36.1	40.1	65	15	10.66	3.55	1.7	84	80	7.4	E			8.5	3	3	25	24	1	1	4
Feb.	48.4	37.8	43.1	67	20	9.44	2.86	0.1	82	77	7.5	ESE			8.5	2	3	23	21	0	*	2
Mar.	50.8	39.8	45.3	68	24	8.27	2.66	1.3	77	71	7.3	SE			8.2	3	4	24	22	1	1	2
Apr.	55.1	44.2	49.7	83	29	5.15	1.34	T	74	70	7.0	WNW			8.0	4	4	22	18	0	*	3
May	58.8	48.2	53.5	86	30	3.53	1.61	0.0	73	69	6.9	NW			7.8	3	8	20	16	0	1	2
June	63.2	52.0	57.6	93	38	2.66	1.66	0.0	75	71	6.8	NW			7.8	3	6	21	15	0	1	1
July	66.7	54.8	60.8	100	42	1.07	1.43	0.0	75	69	7.3	NW			6.4	6	11	14	7	0	1	1
Aug.	67.6	55.9	61.8	82	43	1.45	1.64	0.0	77	71	6.6	NW			6.6	6	11	14	9	0	*	4
Sep.	66.8	53.8	60.3	92	37	3.04	2.63	0.0	75	70	6.2	SE			6.4	9	6	15	11	0	1	5
Oct.	59.2	49.0	54.1	78	30	7.15	3.47	0.0	81	75	6.4	SE			7.3	6	6	19	18	0	1	6
Nov.	51.6	42.6	47.1	66	15	10.36	3.48	0.3	82	77	7.3	SE			7.8	4	5	21	18	*	1	4
Dec.	46.7	38.6	42.7	62	22	13.21	3.03	0.3	86	81	7.7	ESE			8.7	2	3	26	22	*	1	6
Year	56.6	46.1	51.4	100	15	75.99	3.55	3.7	78	73	7.0	SE			7.7	51	70	244	201	2	9	40

PORTLAND, OREG. (Customhouse Building) 45°32'N., 122°40'W. Elevation (ground) 30 feet. WB-1961

Month	Air temperature (°F.) Normal: Daily maximum	Daily minimum	Monthly	Extreme: Record highest	Record lowest	Precipitation (inches): Normal total	Maximum in 24 hrs.	Snow, sleet, mean total	Humidity (percent): 10:00 a.m. PST	4:00 p.m. PST	Wind (knots): Mean speed	Prevailing direction	Maximum speed and direction	Percent of possible sunshine	Mean sky cover sunrise to sunset	Mean number of days: Sunrise to sunset: Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, sleet 1.0 inch or more	Thunderstorms	Heavy fog
(a)				59	59	59	59	21	21	21	13	13	13	12	13	13	13	13	59	59	21	19
Jan.	44.2	34.7	39.5	65	6	5.43	4.61	5.2	81	77	9.0	ESE	47 S	22	8.5	3	3	25	19	2	*	3
Feb.	49.5	38.0	43.8	68	7	4.87	2.67	1.7	80	69	7.6	ESE	53 SW	30	8.5	2	3	23	16	1	*	2
Mar.	55.6	41.1	48.4	83	22	4.15	2.50	0.6	71	61	7.3	ESE	43 S	34	8.5	2	4	25	17	*	*	2
Apr.	62.2	44.9	53.6	93	30	2.43	1.96	0.1	67	54	6.2	NW	52 S	47	7.5	5	5	20	14	*	1	1
May	68.6	49.6	59.1	99	36	1.87	1.83	T	66	54	5.6	NW	36 SW	48	7.3	4	7	20	12	0	2	*
June	73.1	54.4	63.8	102	41	1.62	2.16	0.0	66	49	5.6	NW	35 SW	48	6.9	6	6	18	9	0	1	*
July	79.2	57.8	68.5	107	43	0.42	1.32	0.0	62	46	6.3	NW	27 S	69	4.3	14	9	8	3	0	1	*
Aug.	78.8	57.9	68.4	102	44	0.61	1.29	0.0	65	48	5.7	NW	25 SW	61	5.2	11	10	10	4	0	1	*
Sep.	73.4	54.4	63.9	102	35	1.83	2.88	0.0	67	50	5.1	NW	33 SW	58	5.7	10	8	12	7	0	1	3
Oct.	63.5	48.7	56.1	90	29	3.53	2.43	T	79	66	5.4	ESE	43 SW	38	7.2	5	7	19	12	0	*	7
Nov.	52.7	41.7	47.2	71	15	6.05	4.43	0.1	82	74	6.9	ESE	49 SW	32	8.0	4	4	22	17	*	*	6
Dec.	46.8	37.9	42.4	65	3	7.10	5.01	1.2	84	79	8.3	ESE	50 S	21	9.0	1	3	27	19	*	*	5
Year	62.3	46.8	54.6	107	3	39.91	5.01	8.9	73	61	6.6	NW	53 SW	45	7.2	67	69	229	152	3	7	29

TATOOSH ISLAND, WASH. 48°23'N., 124°44'W. Elevation (ground) 101 feet. WB-1961

Month	Air temperature (°F.) Normal: Daily maximum	Daily minimum	Monthly	Extreme: Record highest	Record lowest	Precipitation (inches): Normal total	Maximum in 24 hrs.	Snow, sleet, mean total	Humidity (percent): 10:00 a.m. PST	4:00 p.m. PST	Wind (knots): Mean speed	Prevailing direction	Maximum speed and direction	Percent of possible sunshine	Mean sky cover sunrise to sunset	Mean number of days: Sunrise to sunset: Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, sleet 1.0 inch or more	Thunderstorms	Heavy fog
(a)				59	59		59	59	44	59	30	22	59	51	55	59	59	59	59	59	59	59
Jan.	44.9	39.0	42.0	64	14	10.19	3.67	3.6	82	83	17.5	E	76 S	26	8.0	4	4	23	22	1	1	1
Feb.	46.5	39.8	43.2	64	16	8.70	4.57	1.5	81	80	15.4	E	73 NE	35	7.5	5	4	19	18	*	*	1
Mar.	48.3	41.0	44.7	69	25	7.82	4.76	1.0	81	80	13.6	E	79 E	39	7.5	5	6	20	20	*	*	1
Apr.	51.5	43.5	47.5	75	33	5.23	3.70	T	80	80	11.7	W	63 SW	44	7.3	5	7	18	17	0	*	2
May	54.8	46.9	50.9	81	36	3.31	2.22	T	82	81	10.0	W	57 S	46	7.2	5	8	18	14	0	*	3
June	57.7	50.2	54.0	84	43	2.58	2.75	0.0	86	84	8.7	SW	61 S	45	7.2	4	8	18	12	0	*	5
July	59.2	51.7	55.5	88	44	1.99	3.72	0.0	89	87	8.7	S	46 S	48	6.8	6	8	17	10	0	*	11
Aug.	59.5	51.9	55.7	78	45	2.01	2.30	0.0	90	90	8.5	S	51 SW	44	7.0	5	8	18	10	0	*	16
Sep.	58.7	50.2	54.5	80	40	3.64	3.79	0.0	87	86	9.7	S	59 NE	47	6.5	7	7	16	11	0	*	10
Oct.	55.5	48.2	51.9	77	33	8.72	5.91	T	85	85	12.9	E	63 S	38	7.0	6	7	18	17	0	1	6
Nov.	50.6	44.1	47.4	68	19	9.52	4.38	0.4	83	84	15.8	E	82 S	27	7.9	3	5	22	21	*	1	2
Dec.	47.1	41.1	44.1	61	20	12.04	4.03	0.8	83	84	17.1	E	74 S	24	8.0	3	5	23	23	*	1	1
Year	52.9	45.6	49.3	88	14	75.75	5.91	7.3	84	84	12.5	E	82 S	40	7.3	58	77	230	195	3	5	59

SEATTLE, WASH. (Federal Office Building) 47°36'N., 122°20'W. Elevation (ground) 14 feet. WB-1961

Month	Air temperature (°F.) Normal: Daily maximum	Daily minimum	Monthly	Extreme: Record highest	Record lowest	Precipitation (inches): Normal total	Maximum in 24 hrs.	Snow, sleet, mean total	Humidity (percent): 10:00 a.m. PST	4:00 p.m. PST	Wind (knots): Mean speed	Prevailing direction	Maximum speed and direction	Percent of possible sunshine	Mean sky cover sunrise to sunset	Mean number of days: Sunrise to sunset: Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, sleet 1.0 inch or more	Thunderstorms	Heavy fog
(a)				28	28		28	28	22	22	11	12	28	28	24	24	24	24	28	28	24	
Jan.	45.2	36.2	40.7	66	11	4.49	2.46	4.7	80	73	6.8	S	55 SW	28	8.0	3	5	23	19	2	*	
Feb.	48.8	38.1	43.5	70	12	3.74	2.69	1.4	77	68	7.0	S	56 S	33	7.7	3	6	19	16	*	*	
Mar.	53.4	40.5	47.0	75	22	3.06	2.32	0.8	70	59	7.5	S	52 SW	42	7.4	4	8	19	16	*	*	
Apr.	59.4	44.1	51.8	87	31	1.94	1.53	T	63	52	7.2	S	56 S	47	6.9	5	9	16	13	0	*	
May	65.6	48.9	57.3	92	35	1.61	1.35	0.0	62	50	6.7	S	39 SW	52	6.4	7	10	14	11	0	1	
June	70.2	53.4	61.8	100	45	1.25	1.08	0.0	63	51	6.6	S	47 SW	49	6.4	7	8	15	9	0	1	
July	75.1	56.1	65.6	100	48	0.52	1.22	0.0	62	46	6.3	NNW	33 SW	63	4.9	12	10	9	5	0	1	
Aug.	74.2	56.2	65.2	97	48	0.87	0.79	0.0	67	50	5.9	NNW	30 SW	56	5.3	10	10	11	6	0	1	
Sep.	68.8	53.2	61.0	92	42	1.56	1.91	0.0	71	56	5.6	SSE	48 SW	53	5.6	9	8	13	8	0	1	
Oct.	60.5	48.2	54.4	78	30	3.08	1.97	T	79	68	5.9	SSE	55 S	36	7.2	5	8	18	14	0	1	
Nov.	51.8	42.1	47.0	70	13	4.46	3.20	0.8	81	75	6.2	SSE	50 SW	29	8.0	3	6	21	17	*	*	
Dec.	47.3	38.9	43.1	65	21	5.34	3.31	0.7	83	77	6.6	SSE	52 SW	24	8.1	3	5	23	19	*	*	
Year	60.0	46.3	53.2	100	11	31.92	3.31	8.4	72	60	6.5	S	56 S	45	6.8	71	93	201	153	3	6	

HONOLULU, HAWAII (Federal Building) 21°19'N., 157°52'W. Elevation (ground) 12 feet. WB-1961

Month	Air temperature (°F.) Normal: Daily maximum	Daily minimum	Monthly	Extreme: Record highest	Record lowest	Precipitation (inches): Normal total	Maximum in 24 hrs.	Snow, sleet, mean total	Humidity (percent): 8:00 a.m. HST	2:00 p.m. HST	Wind (knots): Mean speed	Prevailing direction	Maximum speed and direction	Percent of possible sunshine	Mean sky cover sunrise to sunset	Mean number of days: Sunrise to sunset: Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, sleet 1.0 inch or more	Thunderstorms	Heavy fog
(a)				39	39		39	39	15	15	12	12	10	9	15	12	12	12	39	39	12	12
Jan.	76.7	67.2	72.0	83	57	4.31	8.06	0.0	80	61	8.7	ENE	58 SW	66	5.2	11	12	8	12	0	1	0
Feb.	76.7	67.2	72.0	82	58	2.49	8.07	0.0	78	61	9.6	ENE	55 W	63	6.0	7	12	9	12	0	1	0
Mar.	76.8	67.6	72.2	83	58	2.30	17.41	0.0	74	58	10.0	ENE	51 SE	73	5.8	8	14	9	13	0	1	0
Apr.	77.7	68.8	73.3	83	59	2.05	7.98	0.0	71	57	10.6	ENE	35 NE	73	6.1	7	12	11	12	0	*	0
May	79.5	70.6	75.1	84	64	1.01	2.14	0.0	69	56	11.2	ENE	30 E	73	6.0	8	13	10	11	0	*	0
June	81.3	72.4	76.9	86	64	0.63	0.81	0.0	68	56	11.6	ENE	34 E	75	5.5	7	17	6	11	0	0	0
July	82.2	73.5	77.9	87	68	0.86	1.22	0.0	69	56	11.9	ENE	30 E	77	5.1	9	18	4	13	0	0	0
Aug.	82.8	74.1	78.5	88	68	1.09	2.53	0.0	70	56	12.2	ENE	45 SE	76	5.2	8	17	6	13	0	0	0
Sep.	82.9	73.7	78.3	88	69	1.34	6.02	0.0	70	55	10.3	ENE	30 NE	77	4.9	10	15	5	12	0	*	0
Oct.	82.0	72.9	77.5	87	66	2.28	7.06	0.0	72	58	9.6	ENE	35 SE	72	5.5	8	14	9	12	0	1	0
Nov.	79.7	70.7	75.2	86	62	2.08	6.18	0.0	74	61	9.9	ENE	56 NE	67	5.5	8	13	9	13	0	1	0
Dec.	77.7	68.9	73.3	85	59	3.48	6.54	0.0	75	61	9.9	ENE	51 NE	61	5.4	9	13	9	14	0	1	0
Year	79.7	70.6	75.2	88	57	23.92	17.41	0.0	73	58	10.4	ENE	58 SW	71	5.5	100	170	95	148	0	5	0

HILO, HAWAII, (General Lyman Airport) 19°43'N., 155°04'W. Elevation (ground) 31 feet. WB-1961

Month	Air temperature (°F.) Normal: Daily maximum	Daily minimum	Monthly	Extreme: Record highest	Record lowest	Precipitation (inches): Normal total	Maximum in 24 hrs.	Snow, sleet, mean total	Humidity (percent): 8:00 a.m. HST	2:00 p.m. HST	Wind (knots): Mean speed	Prevailing direction	Maximum speed and direction	Percent of possible sunshine	Mean sky cover sunrise to sunset	Mean number of days: Sunrise to sunset: Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, sleet 1.0 inch or more	Thunderstorms	Heavy fog
(a)				15	15		19	19	12	12	12	12		11	15	15	15	15	19	19	16	16
Jan.	78.4	62.4	70.4	89	55	14.13	9.94	0.0	80	67	6.5	SW		46	6.8	5	11	15	19	0	*	0
Feb.	79.0	62.4	70.7	88	55	9.48	13.41	0.0	82	69	6.8	SW		41	7.1	3	10	15	19	0	2	0
Mar.	78.5	63.1	70.8	88	55	15.72	9.18	0.0	81	67	6.8	SW		41	7.7	2	10	19	23	0	1	0
Apr.	79.2	64.0	71.6	87	56	13.27	9.39	0.0	82	69	6.5	WSW		33	8.2	1	7	22	25	0	1	0
May	81.1	65.1	73.1	85	58	9.00	5.94	0.0	81	69	6.3	WSW		31	8.2	1	9	21	25	0	*	0
June	82.5	66.3	74.4	88	60	6.75	2.25	0.0	79	65	6.3	WSW		42	7.5	2	11	17	24	0	*	0
July	82.6	67.0	74.8	88	62	9.89	5.42	0.0	82	67	6.3	WSW		44	7.6	1	12	18	28	0	*	0
Aug.	83.1	67.7	75.4	93	63	11.92	9.27	0.0	83	70	6.3	WSW		38	7.9	1	9	21	27	0	*	0
Sep.	83.0	67.5	75.3	92	62	10.42	6.02	0.0	80	66	6.2	WSW		41	7.1	2	12	16	24	0	*	0
Oct.	82.2	66.8	74.5	91	62	11.02	8.88	0.0	81	68	6.0	SW		40	7.4	2	11	18	25	0	1	0
Nov.	80.3	65.7	73.0	88	58	12.39	15.59	0.0	83	71	5.8	WSW		32	7.6	2	9	19	24	0	1	0
Dec.	78.8	64.0	71.4	85	56	15.99	10.50	0.0	82	71	6.4	SW		37	7.4	3	10	18	24	0	*	0
Year	80.7	65.2	73.0	93	55	139.98	15.59	0.0	81	68	6.3	WSW		39	7.5	25	121	219	287	0	6	0

691 - 231 O - 63 - 19

LIHUE, HAWAII (Lihue Airport) 21°59'N., 159°21'W. Elevation (ground) 115 feet. WB-1961

Month	Air temperature (°F.)					Precipitation (inches)			Humidity (percent)		Wind (knots)			Percent of possible sunshine	Mean sky cover sunrise to sunset	Mean number of days						
	Normal			Extreme												Sunrise to sunset						
	Daily maximum	Daily minimum	Monthly	Record highest	Record lowest	Normal total	Maximum in 24 hrs.	Snow, sleet, mean total	8:00 a.m. HST	2:00 p.m. HST	Mean speed	Prevailing direction	Maximum speed and direction			Clear	Partly cloudy	Cloudy	Precipitation .01 inch or more	Snow, sleet 1.0 inch or more	Thunderstorms	Heavy fog
(a)				11	11		11	12	12	12	11	11	11	11	12	11	11	11	11	12	11	12
Jan.	77.4	62.7	70.1	84	53	6.23	11.09	0.0	84	67	8.9	ENE	31 SW	51	5.9	8	12	11	15	0	1	0
Feb.	77.7	62.5	70.1	86	53	4.44	7.28	0.0	82	67	10.0	NE	30 E	51	6.4	6	11	11	16	0	1	0
Mar.	77.7	63.5	70.6	85	51	4.07	4.74	0.0	79	65	9.9	NE	31 N	50	6.4	5	14	12	16	0	1	0
Apr.	78.2	65.7	72.0	87	56	3.03	1.50	0.0	76	66	10.4	NE	25 NE	47	7.1	4	12	14	15	0	*	0
May	79.8	68.3	74.1	85	59	2.51	3.30	0.0	75	65	10.8	NE	43 NE	53	6.9	3	14	14	16	0	*	0
June	81.2	71.1	76.2	88	64	1.65	0.80	0.0	75	65	10.9	NE	26 NE	61	6.6	3	15	12	17	0	0	0
July	82.4	72.4	77.4	88	65	1.87	5.04	0.0	76	65	10.9	NE	27 NE	61	6.5	3	18	10	20	0	*	0
Aug.	83.3	72.9	78.1	89	66	2.27	5.43	0.0	76	66	11.2	NE	63 NE	61	6.7	3	16	12	19	0	*	0
Sep.	83.6	72.0	77.8	89	65	2.20	1.98	0.0	77	65	9.7	NE	26 NE	68	5.8	6	16	8	16	0	1	0
Oct.	82.6	70.3	76.5	90	63	4.63	4.99	0.0	79	67	9.3	NE	28 E	59	6.2	5	14	12	19	0	1	0
Nov.	79.7	67.5	73.6	86	57	4.24	11.20	0.0	81	69	10.2	NE	37 S	52	6.4	4	14	12	18	0	1	0
Dec.	77.8	65.2	71.5	85	52	5.35	5.40	0.0	80	68	9.9	NE	50 NE	49	6.5	5	14	12	18	0	1	0
Year	80.1	67.8	74.0	90	51	42.49	11.20	0.0	78	66	10.2	NE	63 NE	55	6.5	55	170	140	205	0	8	0

MEAN SURFACE WATER TEMPERATURES AND SALINITIES

Station	Years	Jan.		Feb.		Mar.		Apr.		May		June		July		Aug.		Sept.		Oct.		Nov.		Dec.		Mean	
		Temp. °F	Sal. ‰	Temp. °F	Sal. ‰	Temp. °F	Sal. ‰	Temp. °F	Sal. ‰	Temp. °F	Sal. ‰	Temp. °F	Sal. ‰	Temp. °F	Sal. ‰	Temp. °F	Sal. ‰	Temp. °F	Sal. ‰	Temp. °F	Sal. ‰	Temp. °F	Sal. ‰	Temp. °F	Sal. ‰	Temp. °F	Sal. ‰
San Diego, Calif. 32°42'N., 117°14'W.	4	56.2	33.2	56.7	33.2	58.2	33.3	59.3	33.5	62.5	33.7	64.0	33.8	67.2	34.1	67.3	34.0	65.1	33.8	63.0	33.5	59.7	33.6	58.1	33.3	61.4	33.6
La Jolla, Calif. 32°52'N., 117°15'W.	47	57.2	33.6	57.0	33.5	58.0	33.5	59.8	33.6	62.7	33.6	65.3	33.7	68.0	33.7	69.2	33.7	66.7	33.6	64.3	33.6	61.3	33.6	59.0	33.6	62.4	33.6
Los Angeles (Outer Harbor), Calif. 33°43'N., 118°16'W.	39	56.7	33.2	57.2	33.1	58.1	33.3	59.4	33.5	61.1	33.6	63.8	33.7	66.0	33.7	66.9	33.7	65.7	33.7	64.2	33.6		33.6	58.6	33.5	61.6	33.5
Santa Monica, Calif. 34°00'N., 118°30'W.	17	56.2	33.5	56.3	33.5	56.9	33.6	58.7	33.7	60.3	33.8	63.6	33.8	66.5	33.8	67.3	33.7	65.9	33.7	63.2	33.6	60.1	33.6	57.9	33.6	61.1	33.7
Avila Beach, Calif. 35°10'N., 120°44'W.	17	53.7	33.5	53.5	33.1	53.2	33.6	53.9	34.0	54.7	34.0	56.6	34.1	58.8	34.1	59.6	34.1	59.3	34.0	58.1	33.8	56.1	33.6	54.8	33.6	56.0	33.8
San Francisco (Ft. Point), Calif. 37°48'N., 122°28'W.	41	50.8	28.8	51.7	27.2	53.1	26.7	54.5	27.1	55.6	28.0	57.3	28.9	58.7	31.0	59.6	32.0	60.2	32.4	59.0	32.1	55.5	30.7	52.4	30.3	55.7	29.6
Alameda, Calif. 37°47'N., 122°18'W.	23	50.5	24.1	53.2	21.7	56.9	21.2	61.4	22.1	64.3	23.5	67.4	25.2	69.1	27.7	69.0	29.4	68.4	30.3	64.1	29.7	57.6	28.6	52.7	26.9	61.2	25.9
Crescent City, Calif. 41°45'N., 124°12'W.	27	49.5	28.5	50.0	27.8	50.4	28.5	51.4	29.4	52.9	30.6	54.6	31.4	56.2	32.4	57.5	32.5	56.4	32.5	53.9	32.1	51.8	30.7	50.4	29.7	52.9	30.5
Astoria (Tongue Point), Oreg. 46°13'N., 123°46'W.	38	40.4	1.6	41.8	0.9	45.7	0.6	51.4	0.3	56.5	0.3	60.8	0.3	66.2	0.4	67.4	0.8	64.2	1.7	57.5	2.6	48.9	2.4	43.6	2.0	53.7	1.2
Tokeland, Willapa Bay, Wash. 46°42'N., 123°58'W.	5	44.6	20.1	44.0	21.7	47.9	21.2	51.4	21.6	55.8	23.7	60.5	23.8	63.3	26.3	63.6	28.9	60.3	29.0	55.9	28.8	49.9	26.0	46.8	23.7	53.7	24.6
Raymond, Willapa Bay, Wash. 46°41'N., 123°45'W.	7	44.2	6.4	45.0	6.8	48.2	5.9	53.5	7.5	59.8	8.8	64.2	11.5	68.5	15.8	68.4	20.8	64.7	19.5	58.3	17.9	48.9	11.4	46.0	8.0	55.8	11.6
Neah Bay, Wash. 48°22'N., 124°37W.	27	45.2	30.4	45.3	30.3	46.2	30.7	48.6	30.8	51.3	31.2	53.0	31.4	53.2	32.1	52.8	32.3	52.2	32.3	51.1	31.8	49.0	31.1	47.0	30.4	49.6	31.2
Seattle (Elliott Bay), Wash., 47°36'N. 122°21'W.	40	47.5	28.2	46.7	28.1	46.7	27.6	47.9	27.1	50.4	27.1	53.2	27.5	55.3	28.5	55.8	29.1	55.2	29.7	53.8	29.8	51.5	29.4	49.4	28.9	51.1	28.4
Friday Harbor, Wash. 48°33'N., 123°00'W.	17	45.4	30.3	44.8	30.3	45.2	30.4	46.6	30.4	48.5	30.3	50.3	30.1	51.7	29.8	51.9	30.2	51.0	30.4	49.6	30.8	48.1	30.7	46.9	30.4	48.3	30.3
Hilo, Hawaii 19°44'N., 155°03'W.	16	70.7	24.6	70.7	24.1	70.3	23.3	70.6	22.5	71.1	22.1	72.0	23.1	72.6	22.7	73.2	22.9	73.5	23.8	73.5	24.2	72.7	2.43	71.5	23.7	71.9	23.4
Honolulu, Hawaii 21°18'N., 157°52'W	18	76.0	34.2	76.0	34.5	75.9	34.5	76.6	34.8	77.6	34.8	78.7	34.9	79.8	34.9	80.2	34.9	80.5	34.9	80.4	34.9	78.8	34.8	77.0	34.8	78.1	34.7
Kaneohe Bay, Hawaii 21°26'N., 157°48'W.	6	73.1	34.5	72.9	34.4	74.0	34.0	75.2	34.4	77.0	34.6	79.3	35.0	79.4	35.0	80.0	35.0	79.6	35.1	79.1	34.9	76.3	34.4	73.2	34.4	76.6	34.6
Midway Islands 28°13'N., 177°22'W.	18	67.6	35.5	67.2	35.5	68.4	35.5	69.8	35.7	72.6	35.8	77.0	35.8	79.4	35.9	80.3	35.8	80.4	35.8	77.3	35.7	73.7	35.8	70.5	35.5	73.7	35.7

‰: This symbol denotes the salinity of sea water, and is defined as the number of grams of salts in 1,000 grams of sea water. For sea water temperature and salinity in greater detail, see Coast and Geodetic Survey Publication 31-3, Surface Water Temperature and Salinity, Pacific Coast, North and South America and Pacific Ocean Islands.

HOURS OF OPERATION OF FOG SIGNALS
(U.S. Coast Guard)

Light station	12 Calendar Years - 1950 thru 1961														Pre - 1950		
	Average													Max. 1 yr.	Ave.	For yrs.	Max. 1 yr.
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year				
Point Loma, Calif. 32°39.9'N., 117°14.5'W.	82	78	62	48	20	43	36	28	99	115	95	110	816	1291	423	32	859
Ballast Point, Calif. 32°41.2'N., 117°14.0'W.	46	45	32	25	7	17	14	10	48	62	59	68	433	660	224	40	619
Los Angeles, Calif. 33°42.5'N., 118°15.0'W.	117	97	75	56	33	46	62	68	105	127	141	157	1084	1889	805	32	2806
Point Vicente, Calif. 33°44.5'N., 118°24.6'W.	59	65	54	47	25	58	52	51	83	97	91	106	788	1442	482	5	573
Point Hueneme, Calif. 34°08.7'N., 119°12.5'W.	53	54	48	64	52	90	108	114	117	118	72	79	969	1343	534	33	1008
Anacapa Island, Calif. 34°00.9'N., 119°21.5'W.	70	67	52	90	73	111	142	142	129	143	89	88	1196	1705	954	13	1707
Point Conception, Calif. 34°26.9'N., 120°28.2'W.	50	44	33	42	47	91	104	118	102	94	54	61	840	1462	304	61	647
Point Arguello, Calif. 34°34.6'N., 120°39.2'W.	71	61	57	62	78	121	214	226	190	163	71	62	1376	2197	1014	44	1991
San Luis Obispo, Calif. 35°09.6'N., 120°45.6'W.	56	53	45	65	83	139	218	236	207	165	71	51	1389	1927	1106	57	2170
Piedras Blancas, Calif. 35°39.9'N., 121°17.1'W.	96	95	72	92	110	155	224	240	208	196	109	93	1690	2167	1028	44	1604
Point Sur, Calif. 36°18.4'N., 121°54.0'W.	47	67	49	55	72	117	241	232	163	143	77	44	1307	1996	1048	59	1958
Point Pinos, Calif. 36°38.2'N., 121°56.1'W.	49	60	49	56	48	103	185	203	156	153	98	68	1228	2321	756	9	1032
Pigeon Point, Calif. 37°10.9'N., 122°23.6'W.	86	89	68	71	65	107	206	196	181	176	117	94	1456	1963	863	65	1889
Point Montara, Calif. 37°32.2'N., 122°31.1'W.	45	54	44	41	48	81	147	154	115	128	84	60	1001	1672	914	65	1325
Farallon, Calif. 37°41.8'N., 123°00.1'W.	142	125	90	77	90	138	282	300	195	202	173	148	1962	2479	984	65	1886
San Francisco Lightship, Calif. 37°45.0'N., 122°41.5'W.	114	88	59	46	60	98	204	211	143	149	123	125	1420	1809	1066	46	1802
Point Bonita, Calif. 37°48.9'N., 122°31.7'W.	121	87	51	56	60	87	202	220	156	155	126	139	1460	2220	1041	65	1284
Alcatraz, Calif. 37°49.5'N., 122°25.2'W.	52	43	14	14	16	27	65	76	51	63	37	52	510	954	443	44	719
Carquinez Strait, Calif. 38°04.2'N., 122°14.6'W.	101	57	11	4	2	1	6	7	8	31	78	111	417	655	230	39	420

HOURS OF OPERATION OF FOG SIGNALS
(U.S. Coast Guard)

Light station	12 Calendar Years - 1950 thru 1961														Pre - 1950		
	Average													Max. 1 yr.	Ave.	For yrs.	Max. 1 yr.
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year				
Point Reyes, Calif. 37°59.7'N., 123°01.3'W.	136	124	115	92	119	162	360	395	253	243	179	136	2314	2920	1493	65	2360
Point Arena, Calif. 38°57.3'N., 123°44.4'W.	108	103	62	68	71	99	269	310	207	218	169	128	1812	2417	1109	65	1660
Point Cabrillo, Calif. 39°20.9'N., 123°49.5'W.	46	58	36	45	49	78	239	258	178	165	120	81	1353	1750	925	40	1833
Blunts Reef Lightship, Calif. 40°26.4'N., 124°30.3'W.	91	88	70	71	81	111	249	255	220	211	152	118	1717	2328	1149	39	1943
St. George Reef, Calif. 41°50.2'N., 124°22.5'W.	67	62	55	59	62	121	235	258	201	196	127	101	1544	1833	865	57	1348
Cape Arago, Oreg. 43°20.5'N., 124°22.5'W.	16	28	21	33	47	84	178	227	158	116	67	41	1016	1467	777	52	1793
Columbia River Lightship, Oreg. 46°11.1'N., 124°11.0'W.	77	69	48	37	26	53	60	90	78	80	79	57	754	1052	647	55	1230
Grays Harbor, Wash. 46°54.5'N., 124°07.0'W.	273	208	159	143	96	129	187	232	252	275	240	264	2458	3530	1308	20	2271
Destruction Island, Wash. 47°40.5'N., 124°29.1'W.	45	46	38	32	41	63	110	131	100	73	68	66	813	1262	619	56	1169
Cape Flattery, Wash. 48°23.5'N., 124°44.1'W.	92	77	61	62	58	104	160	219	146	111	85	98	1273	2721	769	65	1318
Slip Point, Wash. 48°15.9'N., 124°14.9'W.	64	38	25	17	23	38	68	100	96	85	68	63	685	1298	382	44	855
Ediz Hook, Wash. 48°08.4'N., 123°24.1'W.	37	33	17	20	17	30	72	97	110	89	50	46	618	991	492	46	894
Point Wilson, Wash. 48°08.7'N., 122°45.2'W.	29	18	15	14	16	34	73	79	98	73	45	24	518	802	441	65	833
West Point, Wash. 47°39.7'N., 122°26.1'W.	21	18	5	5	7	4	13	17	45	44	34	32	245	383	390	62	811
Browns Point, Wash. 47°18.4'N., 122°26.6'W.	79	39	27	13	11	7	11	21	64	112	82	94	560	868	804	44	1504
Burrows Island, Wash. 48°28.6'N., 122°42.7'W.	22	12	13	5	7	19	45	64	73	63	19	16	358	522	446	43	1004
Lime Kiln, Wash. 48°31.0'N., 123°09.1'W.	12	8	7	3	3	10	11	23	43	48	23	5	196	361	194	30	408
Patos Island, Wash. 48°47.3'N., 122°58.2'W.	45	17	18	3	6	9	7	14	44	67	44	33	307	653	255	55	526

TRANS-PACIFIC DISTANCES

June 15, 1963

Figure at intersection of columns opposite ports in question is the nautical mileage between the two. Example: San Francisco, Calif., is 2091 nautical miles from Honolulu, Hawaii.

	Panama Canal (Pac. Ent.) 8°53.0'N., 79°31.0'W.	San Diego, Calif. 32°43.0'N., 117°10.5'W.	Long Beach, Calif. 33°46.2'N., 118°13.3'W.	Los Angeles, Calif. 33°45.0'N., 118°16.2'W.	San Francisco, Calif. 37°48.5'N., 122°24.0'W.	Astoria, Oreg. 46°11.7'N., 123°50.0'W.	Portland, Oreg. 45°33.0'N., 122°41.7'W.	CAPE FLATTERY, WASH. 48°26.0'N., 124°47.0'W.	SWIFTSURE BANK, WASH. 48°31.0'N., 125°00.0'W.	Seattle, Wash. 47°36.2'N., 122°20.3'W.	Ketchikan, Alaska 55°20.5'N., 131°38.7'W.	Sitka, Alaska 57°03.1'N., 135°20.5'W.	CAPE SPENCER, ALASKA 58°10.0'N., 136°38.3'W.	Seward, Alaska 60°06.0'N., 149°26.0'W.	Anchorage, Alaska 61°14.2'N., 149°53.3'W.	Kodiak, Alaska 57°47.1'N., 152°25.1'W.	UNIMAK PASS, ALASKA 54°20.0'N., 164°45.0'W.	Kuluk Bay, Alaska 51°51.6'N., 176°37.6'W.	Hilo, Hawaii 19°44.1'N., 155°03.5'W.	Kawaihae, Hawaii 20°02.3'N., 155°49.9'W.	Kahului, Hawaii 20°54.0'N., 156°28.2'W.	Honolulu, Hawaii 21°18.5'N., 157°52.3'W.	Pearl Harbor, Hawaii 21°20.0'N., 157°58.3'W.	Nawiliwili, Hawaii 21°57.4'N., 159°21.5'W.	Port Allen, Hawaii 21°54.1'N., 159°35.6'W.	Midway Islands 28°13.0'N., 177°22.0'W.
2867																											
2939	94																										
2939	95	3																									
3270	455	374	371																								
3803	989	908	904	567																							
3888	1074	992	989	652	85																						
3920	1104	1024	1020	683	153	238																					
--	--	--	--	--	--	--	10																				
4044	1228	1148	1144	807	278	362	124	134																			
4387	1575	1497	1493	1156	660	745	--	518	659*																		
4538	1723	1643	1639	1302	815	900	--	681	815	224																	
4603	1787	1707	1703	1366	883	968	--	739	976*	307	85																
4940	2124	2043	2040	1702	1242	1327	--	1100	1234	682	494	422															
5117	2303	2223	2220	1882	1435	1520	--	1294	1428	892	708	641	274														
4924	2115	2034	2031	1693	1261	1346	--	1124	1258	742	564	505	175	242													
5228	2412	2331	2328	1990	1626	1711	--	1510	1644	1193	1027	987	652	688	505												
5604	2806	2725	2722	2403	2071	2156	--	1973	2107	1656	1490	1450	1115	1151	968	463											
4527	2175	2143	2140	2019	2214	2299	2260	--	2384	2398	2410	2447	2439	2542	2296	2126	2198										
4594	2219	2183	2180	2051	2235	2320	2276	--	2400	2405	2412	2445	2432	2535	2289	2110	2164	83									
4609	2212	2173	2170	2036	2207	2292	2245	--	2369	2361	2365	2398	2377	2479	2233	2044	2099	121	85								
4685	2278	2236	2233	2091	2246	2331	2285	--	2409	2383	2385	2411	2373	2477	2230	2028	2061	196	140	89							
4690	2283	2241	2238	2096	2251	2336	2290	--	2414	2388	2390	2416	2378	2482	2235	2024	2057	201	145	94	9						
4767	2330	2284	2281	2128	2262	2347	2289	--	2413	2368	2361	2388	2332	2440	2184	1963	1989	287	230	181	96	92					
4777	2347	2302	2299	2146	2281	2366	2308	--	2432	2387	2380	2407	2351	2459	2203	1972	1990	297	240	193	106	102	21				
5707	3097	3034	3031	2792	2724	2809	2694	--	2818	2570	2481	2472	2250	2305	2088	1680	1460	1338	1278	1232	1150	1146	1069	1042			

*Via inside passage

COASTWISE DISTANCES

SAN DIEGO, CALIF., TO CAPE FLATTERY, WASH.

June 15, 1963

Figure at intersection of columns opposite ports in question is the nautical mileage between the two. Example: San Francisco, Calif., is 652 nautical miles from Portland, Oreg.

	San Diego, Calif. 32°43.0'N., 117°10.5'W.	Newport Beach, Calif. 33°37.1'N., 117°55.5'W.	Long Beach, Calif. 33°46.2'N., 118°13.3'W.	Los Angeles, Calif. 33°45.0'N., 118°16.2'W.	Port Hueneme, Calif. 34°09.0'N., 119°12.4'W.	Santa Barbara, Calif. 34°24.5'N., 119°41.1'W.	Port San Luis, Calif. 35°10.4'N., 120°44.8'W.	Monterey, Calif. 36°36.5'N., 121°53.0'W.	San Francisco, Calif. 37°48.5'N., 122°24.0'W.	Oakland, Calif. 37°48.2'N., 122°19.5'W.	Stockton, Calif. 37°57.2'N., 121°18.8'W.	Sacramento, Calif. 38°33.8'N., 121°33.0'W.	Eureka, Calif. 40°47.8'N., 124°11.2'W.	Crescent City, Calif. 41°44.5'N., 124°11.4'W.	Coos Bay, Oreg. 43°22.4'N., 124°12.5'W.	Gardiner, Oreg. 43°43.9'N., 124°06.8'W.	Florence, Oreg. 43°58.0'N., 124°06.3'W.	Newport, Oreg. 44°37.8'N., 124°03.1'W.	Depoe Bay, Oreg. 44°48.6'N., 124°03.6'W.	Garibaldi, Oreg. 45°33.3'N., 123°55.1'W.	Astoria, Oreg. 46°11.7'N., 123°50.0'W.	Longview, Wash. 46°06.3'N., 122°57.7'W.	Vancouver, Wash. 45°37.6'N., 122°41.3'W.	Portland, Oreg. 45°33.0'N., 122°41.7'W.	South Bend, Wash. 46°40.1'N., 123°47.5'W.	Aberdeen, Wash. 46°58.4'N., 123°48.5'W.	CAPE FLATTERY, WASH. 48°26.0'N., 124°47.0'W.
San Diego, Calif. 32°43.0'N., 117°10.5'W.																											
Newport Beach, Calif. 33°37.1'N., 117°55.5'W.	78																										
Long Beach, Calif. 33°46.2'N., 118°13.3'W.	94	25																									
Los Angeles, Calif. 33°45.0'N., 118°16.2'W.	95	27	3																								
Port Hueneme, Calif. 34°09.0'N., 119°12.4'W.	147	81	66	62																							
Santa Barbara, Calif. 34°24.5'N., 119°41.1'W.	174	108	94	90	29																						
Port San Luis, Calif. 35°10.4'N., 120°44.8'W.	259	193	179	175	116	91																					
Monterey, Calif. 36°36.5'N., 121°53.0'W.	370	304	290	286	228	203	121																				
San Francisco, Calif. 37°48.5'N., 122°24.0'W.	455	389	374	371	312	287	205	96																			
Oakland, Calif. 37°48.2'N., 122°19.5'W.	458	392	377	374	315	290	208	100	3																		
Stockton, Calif. 37°57.2'N., 121°18.8'W.	526	460	445	442	383	358	276	167	75	78																	
Sacramento, Calif. 38°33.8'N., 121°33.0'W.	530	464	449	446	387	362	280	171	79	82	75																
Eureka, Calif. 40°47.8'N., 124°11.2'W.	653	587	572	569	510	485	403	294	232	235	303	307															
Crescent City, Calif. 41°44.5'N., 124°11.4'W.	704	638	624	620	561	537	455	346	283	287	354	358	64														
Coos Bay, Oreg. 43°22.4'N., 124°12.5'W.	817	751	736	733	674	649	567	459	396	399	467	471	180	125													
Gardiner, Oreg. 43°43.9'N., 124°06.8'W.	832	766	751	748	689	664	582	474	411	414	482	486	195	140	42												
Florence, Oreg. 43°58.0'N., 124°06.3'W.	848	782	768	764	706	681	599	490	427	430	498	502	212	156	59	36											
Newport, Oreg. 44°37.8'N., 124°03.1'W.	881	815	800	797	737	713	631	522	459	463	531	534	244	188	92	69	43										
Depoe Bay, Oreg. 44°48.6'N., 124°03.6'W.	891	825	810	807	748	723	641	532	469	473	541	544	254	199	101	78	54	16									
Garibaldi, Oreg. 45°33.3'N., 123°55.1'W.	937	871	857	853	794	770	687	579	516	520	588	591	301	245	150	127	102	63	50								
Astoria, Oreg. 46°11.7'N., 123°50.0'W.	989	922	908	904	845	821	739	630	567	570	639	642	352	296	201	178	153	115	101	58							
Longview, Wash. 46°06.3'N., 122°57.7'W.	1034	967	953	949	890	866	783	675	612	615	684	687	397	341	246	223	198	160	146	103	45						
Vancouver, Wash. 45°37.6'N., 122°41.3'W.	1070	1003	988	985	925	901	819	710	647	651	719	722	432	377	281	258	234	196	182	138	80	34					
Portland, Oreg. 45°33.0'N., 122°41.7'W.	1074	1007	992	989	930	905	823	714	652	655	723	727	436	381	285	262	238	200	186	142	85	39	13				
South Bend, Wash. 46°40.1'N., 123°47.5'W.	1019	953	939	935	876	852	769	661	598	601	670	673	383	327	232	209	184	146	133	90	63	108	143	147			
Aberdeen, Wash. 46°58.4'N., 123°48.5'W.	1031	965	951	947	888	864	781	673	610	613	682	685	395	339	244	221	196	158	144	102	75	119	155	159	53		
CAPE FLATTERY, WASH. 48°26.0'N., 124°47.0'W.	1104	1038	1024	1020	961	937	854	746	683	686	755	758	468	411	321	298	273	235	222	179	153	198	234	238	131	117	

SAN FRANCISCO BAY AREA DISTANCES

CALIFORNIA

June 15, 1963

Figure at intersection of columns opposite ports in question is the nautical mileage between the two. Example: Sacramento, Calif., is 74 nautical miles from Napa, Calif.

	San Francisco Bay								San Pablo Bay				Suisun Bay			San Joaquin R.	Sacramento River			
	San Francisco 37°48.5'N., 122°24.0'W.	Hunters Point 37°43.1'N., 122°21.5'W.	Redwood City 37°30.8'N., 122°12.5'W.	Oakland 37°48.2'N., 122°19.5'W.	Richmond 37°54.6'N., 122°21.7'W.	Sausalito 37°51.6'N., 122°28.6'W.	San Rafael 37°58.1'N., 122°30.7'W.	Petaluma 38°14.1'N., 122°38.2'W.	Vallejo 38°05.3'N., 122°15.3'W.	Napa 38°17.7'N., 122°16.9'W.	Benicia 38°02.4'N., 122°08.2'W.	Pittsburg 38°02.1'N., 121°52.6'W.	Antioch 38°01.1'N., 121°48.7'W.	Stockton 37°57.2'N., 121°18.8'W.	Hills Ferry 37°20.4'N., 120°58.5'W.	Rio Vista 38°09.3'N., 121°41.3'W.	Sacramento 38°33.8'N., 121°33.0'W.	Knights Landing 38°48.1'N., 121°43.1'W.	Colusa 39°13.0'N., 122°00.0'W.	Chico Landing 39°42.6'N., 121°56.6'W.
	6																			
	22	16																		
	3	7	22																	
	11	17	32	14																
	5	11	27	8	7															
	13	19	35	16	9	11														
	33	39	54	36	29	31	27													
	23	29	44	26	19	21	17	28												
	37	43	58	40	34	36	32	43	15											
	27	33	49	30	24	25	21	33	8	22										
	40	46	62	43	37	39	35	46	21	36	14									
	44	50	65	47	40	42	38	50	24	39	17	3								
	75	81	96	78	71	73	69	81	55	70	48	35	31							
	147	153	168	149	143	145	141	153	127	142	120	107	103	74						
	52	58	73	55	49	51	47	58	33	48	26	14	17	48	100					
	78	84	100	81	75	77	73	85	59	74	52	40	44	75	127	27				
	107	113	129	110	104	106	102	114	88	103	81	69	73	84	156	56	29			
	155	161	177	158	152	154	150	162	136	151	129	117	121	132	204	104	77	47		
	197	203	219	200	194	196	192	204	178	193	171	159	163	174	246	146	119	89	42	

DISTANCES ON COLUMBIA RIVER SYSTEM

June 15, 1963

Figure at intersection of columns opposite ports in question is the nautical mileage between the two. Example: Astoria, Oreg., is 85 nautical miles from Portland, Oreg.

	Columbia River												Willamette River												Snake River		
	Columbia River Mouth 46°14.8'N., 124°05.5'W.	Ilwaco, Wash. 46°18.3'N., 124°02.2'W.	Warrenton, Oreg. 46°10.1'N., 123°55.0'W.	Astoria, Oreg. 46°11.7'N., 123°50.0'W.	Longview, Wash. 46°08.3'N., 122°57.7'W.	St. Helens, Oreg. 45°51.7'N., 122°47.6'W.	Vancouver, Wash. 45°37.6'N., 122°41.3'W.	Bonneville Lock & Dam 45°38.3'N., 121°56.8'W.	Hood River (town), Oreg. 45°43.0'N., 121°30.0'W.	The Dalles Lock & Dam 45°36.9'N., 121°08.3'W.	John Day Lock & Dam Site 45°42.9'N., 120°41.5'W.	Arlington, Oreg. 45°43.6'N., 120°12.2'W.	Umatilla, Oreg. 45°55.4'N., 119°20.5'W.	McNary Lock & Dam 45°56.4'N., 119°17.9'W.	Port of Walla Walla, Wash. 46°06.0'N., 118°55.3'W.	Pasco, Wash. 46°13.2'N., 119°05.9'W.	Richland, Wash. 46°16.5'N., 119°16.1'W.	Portland, Oreg. 45°33.0'N., 122°41.7'W.	Oregon City, Oreg. 45°21.5'N., 122°36.5'W.	Salem, Oreg. 44°56.2'N., 123°03.1'W.	Albany, Oreg. 44°38.3'N., 123°06.2'W.	Corvallis, Oreg. 44°34.0'N., 123°15.3'W.	Harrisburg, Oreg. 44°16.0'N., 123°10.2'W.	Ice Harbor Dam, Wash. 46°15.1'N., 118°52.7'W.	Central Ferry, Wash. 46°37.6'N., 117°46.6'W.	Lewiston, Idaho 46°25.1'N., 116°59.9'W.	Johnson Bar Landing, Idaho 45°27.6'N., 116°33.8'W.
Columbia River																											
Ilwaco, Wash.	6																										
Warrenton, Oreg.	11	12																									
Astoria, Oreg.	12	13	4																								
Longview, Wash.	58	59	50	45																							
St. Helens, Oreg.	75	76	67	62	17																						
Vancouver, Wash.	92	93	84	80	34	20																					
Bonneville Lock & Dam	126	127	118	114	68	55	35																				
Hood River (town), Oreg.	148	149	140	136	90	76	56	22																			
The Dalles Lock & Dam	166	167	159	154	108	95	75	40	18																		
John Day Lock & Dam Site	188	189	180	176	130	117	96	62	40	22																	
Arlington, Oreg.	210	211	202	198	152	138	118	84	62	44	22																
Umatilla, Oreg.	251	252	244	239	193	180	160	125	103	85	63	42															
McNary Lock & Dam	254	254	246	241	195	182	162	127	106	87	65	44	2														
Port of Walla Walla, Wash.	276	276	268	263	217	204	184	149	128	109	87	66	24	22													
Pasco, Wash.	285	286	277	273	227	214	193	159	137	119	97	75	34	32	10												
Richland, Wash.	293	294	285	281	235	222	202	167	145	127	105	83	42	40	18	8											
Portland, Oreg.	97	98	89	85	39	25	13	47	69	87	109	130	172	174	196	206	214										
Willamette River																											
Oregon City, Oreg.	110	111	103	98	52	39	26	61	82	101	123	144	186	188	210	220	228	14									
Salem, Oreg.	162	163	154	149	104	90	77	112	134	152	174	195	237	239	261	271	279	65	51								
Albany, Oreg.	192	193	184	180	134	121	108	142	164	183	204	226	268	270	292	301	309	96	82	31							
Corvallis, Oreg.	203	203	195	190	144	131	118	153	174	193	215	236	278	280	302	312	320	106	92	41	10						
Harrisburg, Oreg.	230	230	222	217	171	158	145	180	201	220	242	263	305	307	329	339	347	133	119	68	37	27					
Ice Harbor Dam, Wash.	291	292	283	278	233	219	199	164	143	124	102	81	39	37	15	12	20	211	225	276	307	317	344				
Snake River																											
Central Ferry, Wash.	354	355	346	342	296	282	262	228	206	188	166	144	103	101	79	75	83	275	288	340	370	380	407	63			
Lewiston, Idaho	404	404	396	391	345	332	312	277	256	237	215	194	152	150	128	125	133	324	338	389	420	430	457	113	50		
Johnson Bar Landing, Idaho	483	484	475	470	425	411	391	356	335	316	294	273	231	229	207	204	212	403	417	468	499	509	536	192	129	79	

DISTANCES IN STRAIT OF JUAN DE FUCA AND STRAIT OF GEORGIA

CAPE FLATTERY, WASH., TO SEATTLE, WASH., AND VANCOUVER, CANADA

February 21, 1959

Figure at intersection of columns opposite ports in question is the nautical mileage between the two. Example: Port Angeles, Wash., is 69 nautical miles from Seattle, Wash.

	CAPE FLATTERY, WASH. 48°26.0'N., 124°47.0'W.	SWIFTSURE BANK, WASH. 48°31.0'N., 125°00.0'W.	Neah Bay, Wash. 48°22.4'N., 124°36.5'W.	Port Angeles, Wash. 48°07.5'N., 123°26.4'W.	Victoria, Canada 48°25.0'N., 123°23.5'W.	Port Townsend, Wash. 48°06.8'N., 122°45.2'W.	Port Ludlow, Wash. 47°55.3'N., 122°41.0'W.	Port Gamble, Wash. 47°51.3'N., 122°34.7'W.	Everett, Wash. 47°59.3'N., 122°13.2'W.	Point Wells, Wash. 47°47.1'N., 122°23.7'W.	Seattle, Wash. 47°36.2'N., 122°20.3'W.	Eagle Harbor, Wash. 47°37.2'N., 122°30.7'W.	Bremerton, Wash. 47°33.5'N., 122°38.0'W.	Tacoma, Wash. 47°16.0'N., 122°26.0'W.	Olympia, Wash. 47°03.1'N., 122°54.3'W.	Roche Harbor, Wash. 48°36.6'N., 123°09.1'W.	Friday Harbor, Wash. 48°32.2'N., 123°00.9'W.	Anacortes, Wash. 48°31.4'N., 122°36.7'W.	Bellingham, Wash. 48°45.1'N., 122°29.0'W.	Blaine, Wash. 48°59.5'N., 122°45.9'W.	Nanaimo, Canada 49°10.1'N., 123°56.0'W.	New Westminster, Canada 49°12.0'N., 122°54.5'W.	Vancouver, Canada 49°17.4'N., 123°06.6'W.
SWIFTSURE BANK, WASH. 48°31.0'N., 125°00.0'W.	10																						
Neah Bay, Wash. 48°22.4'N., 124°36.5'W.	10	20																					
Port Angeles, Wash. 48°07.5'N., 123°26.4'W.	61	71	54																				
Victoria, Canada 48°25.0'N., 123°23.5'W.	62	71	55	19																			
Port Townsend, Wash. 48°06.8'N., 122°45.2'W.	86	96	79	32	34																		
Port Ludlow, Wash. 47°55.3'N., 122°41.0'W.	100	110	93	46	48	16																	
Port Gamble, Wash. 47°51.3'N., 122°34.7'W.	104	114	97	50	53	21	10																
Everett, Wash. 47°59.3'N., 122°13.2'W.	117	127	110	63	66	34	26	28															
Point Wells, Wash. 47°47.1'N., 122°23.7'W.	111	121	103	56	59	27	19	21	16														
Seattle, Wash. 47°36.2'N., 122°20.3'W.	124	134	116	69	72	40	32	34	30	14													
Eagle Harbor, Wash. 47°37.2'N., 122°30.7'W.	123	133	115	68	71	40	32	34	29	14	8												
Bremerton, Wash. 47°33.5'N., 122°38.0'W.	131	141	124	77	80	48	40	42	38	23	14	13											
Tacoma, Wash. 47°16.0'N., 122°26.0'W.	143	153	136	89	91	59	52	53	49	34	25	25	29										
Olympia, Wash. 47°03.1'N., 122°54.3'W.	168	178	160	113	115	84	75	78	73	59	50	50	50	34									
Roche Harbor, Wash. 48°36.6'N., 123°09.1'W.	83	92	76	36	25	41	54	58	71	64	77	76	85	96	121								
Friday Harbor, Wash. 48°32.2'N., 123°00.9'W.	87	96	80	37	30	30	44	48	62	54	67	67	76	86	112	12							
Anacortes, Wash. 48°31.4'N., 122°36.7'W.	93	102	86	42	36	30	43	47	49	54	66	66	74	86	110	27	18						
Bellingham, Wash. 48°45.1'N., 122°29.0'W.	108	117	101	54	50	43	57	61	63	68	80	80	88	100	124	37	28	17					
Blaine, Wash. 48°59.5'N., 122°45.9'W.	112	121	105	65	55	59	72	76	80	83	95	95	104	115	139	35	37	36	38				
Nanaimo, Canada 49°10.1'N., 123°56.0'W.	145	154	138	99	89	97	111	115	118	121	134	134	142	154	177	66	69	76	75	55			
New Westminster, Canada 49°12.0'N., 122°54.5'W.	139	148	132	93	82	91	105	109	114	116	128	128	137	148	171	60	60	70	71	48	48		
Vancouver, Canada 49°17.4'N., 123°06.6'W.	141	150	133	95	83	92	106	110	115	117	129	129	138	149	173	62	62	71	72	48	36	41	

HAWAII DISTANCES

June 15, 1963

Figure at intersection of columns opposite ports in question is the nautical mileage between the two. Example: Hilo is 196 nautical miles from Honolulu.

	Hilo, Hawaii 19°44.1'N., 155°03.5'W.	Napoopoo, Hawaii 19°28.6'N., 155°55.3'W.	Kailua, Hawaii 19°38.6'N., 156°00.0'W.	Kawaihae, Hawaii 20°02.3'N., 155°49.9'W.	Mahukona, Hawaii 20°11.2'N., 155°54.2'W.	Hana, Maui 20°45.6'N., 155°59.1'W.	Lahaina (Mala), Maui 20°53.5'N., 156°41.5'W.	Kahului, Maui 20°54.0'N., 156°28.2'W.	Kaunalapau, Lanai 20°47.4'N., 156°59.7'W.	Kamalo, Molokai 21°02.9'N., 156°52.7'W.	Kaunakakai, Molokai 21°05.1'N., 157°02.0'W.	Haleolono, Molokai 21°05.2'N., 157°15.2'W.	Kalaupapa, Molokai 21°11.7'N., 156°59.3'W.	Honolulu, Oahu 21°18.5'N., 157°52.3'W.	Pearl Harbor, Oahu 21°20.0'N., 157°58.3'W.	Ahukini, Kauai 21°59.7'N., 159°20.1'W.	Nawiliwili, Kauai 21°57.4'N., 159°21.5'W.	Port Allen, Kauai 21°54.1'N., 159°35.6'W.	Waimea, Kauai 21°57.4'N., 159°40.4'W.	Hanalei, Kauai 22°12.9'N., 159°30.1'W.	Nonopapa, Niihau 21°52.0'N., 160°14.1'W.	Midway Islands 28°13.0'N., 177°22.0'W.	Johnston Island 16°44.6'N., 169°31.2'W.	Palmyra Island 5°52.5'N., 162°08.0'W.
Hilo, Hawaii 19°44.1'N., 155°03.5'W.																								
Napoopoo, Hawaii 19°28.6'N., 155°55.3'W.	120																							
Kailua, Hawaii 19°38.6'N., 156°00.0'W.	109	11																						
Kawaihae, Hawaii 20°02.3'N., 155°49.9'W.	83	45	34																					
Mahukona, Hawaii 20°11.2'N., 155°54.2'W.	72	50	39	12																				
Hana, Maui 20°45.6'N., 155°59.1'W.	85	84	73	48	36																			
Lahaina (Mala), Maui 20°53.5'N., 156°41.5'W.	125	99	88	72	63	57																		
Kahului, Maui 20°54.0'N., 156°28.2'W.	121	120	110	85	74	37	27																	
Kaunalapau, Lanai 20°47.4'N., 156°59.7'W.	136	101	91	82	76	72	25	50																
Kamalo, Molokai 21°02.9'N., 156°52.7'W.	137	112	102	86	77	59	15	30	25															
Kaunakakai, Molokai 21°05.1'N., 157°02.0'W.	145	120	109	93	85	69	23	39	21	12														
Haleolono, Molokai 21°05.2'N., 157°15.2'W.	155	124	114	103	95	80	34	50	24	22	13													
Kalaupapa, Molokai 21°11.7'N., 156°59.3'W.	154	138	127	110	102	70	39	41	54	37	45	33												
Honolulu, Oahu 21°18.5'N., 157°52.3'W.	196	157	147	140	133	119	73	89	60	61	52	40	53											
Pearl Harbor, Oahu 21°20.0'N., 157°58.3'W.	201	162	152	145	138	124	78	94	65	66	57	45	58	9										
Ahukini, Kauai 21°59.7'N., 159°20.1'W.	287	245	236	230	223	210	165	181	151	153	144	132	143	96	92									
Nawiliwili, Kauai 21°57.4'N., 159°21.5'W.	287	244	235	230	223	210	165	181	151	153	144	132	144	96	92	5								
Port Allen, Kauai 21°54.1'N., 159°35.6'W.	297	254	245	240	233	220	177	193	161	163	154	142	156	106	102	23	21							
Waimea, Kauai 21°57.4'N., 159°40.4'W.	303	260	251	246	239	226	182	199	167	169	160	148	162	112	108	29	27	8						
Hanalei, Kauai 22°12.9'N., 159°30.1'W.	308	266	257	251	244	224	186	194	172	173	164	152	159	116	112	29	32	42	35					
Nonopapa, Niihau 21°52.0'N., 160°14.1'W.	332	287	278	277	272	262	214	232	199	203	193	181	194	147	143	65	63	45	40	52				
Midway Islands 28°13.0'N., 177°22.0'W.	1338	--	--	1278	--	--	--	1232	--	--	--	--	--	1150	1146	--	1069	1042	--	--	--			
Johnston Island 16°44.6'N., 169°31.2'W.	905	--	--	811	--	--	--	798	--	--	--	--	--	725	722	--	668	656	--	--	--	825		
Palmyra Island 5°52.5'N., 162°08.0'W.	959	--	--	928	--	--	--	1010	--	--	--	--	--	959	960	--	986	979	--	--	--	1606	785	

Radio Bearing Conversion Table

Table of corrections, in minutes

[DIFFERENCE OF LONGITUDE IN DEGREES]

Mid. L.	½°	1°	1½°	2°	2½°	3°	3½°	4°	4½°	5°	5½°	6°	6½°	7°	7½°	8°	8½°	9°	9½°	10°
15°	4	8	12	16	19	23	27	31	35	40	43	47	50	54	58	62	66	70	74	78
16°	4	8	12	17	21	25	29	33	37	41	45	50	54	58	62	66	70	74	79	83
17°	4	9	13	18	22	26	31	35	39	44	48	53	57	61	66	70	75	79	83	88
18°	5	9	13	19	23	28	32	37	42	46	51	56	60	65	70	74	79	83	88	93
19°	5	10	15	20	24	29	34	39	44	49	54	59	63	68	73	78	83	88	93	98
20°	5	10	15	21	26	31	36	41	46	51	56	62	67	72	77	82	87	92	98	103
21°	5	11	16	21	27	32	38	43	48	54	59	64	70	75	81	86	91	97	102	108
22°	6	11	17	22	28	34	39	45	51	56	62	67	73	79	84	90	96	101	107	112
23°	6	12	18	23	29	35	41	47	53	59	64	70	76	82	88	94	100	105	111	117
24°	6	12	18	24	31	37	43	49	55	61	67	73	79	85	92	98	104	110	116	122
25°	6	13	19	25	32	38	44	51	57	63	70	76	82	89	95	101	108	114	120	127
26°	7	13	20	26	33	39	46	53	59	66	72	79	85	92	99	105	112	118	125	131
27°	7	14	20	27	34	41	48	54	61	68	75	82	89	95	102	109	116	123	129	136
28°	7	14	21	28	35	42	49	56	63	70	77	84	92	99	106	113	120	127	134	141
29°	7	15	21	29	36	44	51	58	65	73	80	87	95	102	109	116	124	131	138	145
30°	7	15	22	30	38	45	53	60	68	75	83	90	98	105	113	120	127	135	143	150
31°	8	15	23	31	39	46	54	62	70	77	85	93	100	108	116	124	131	139	146	155
32°	8	16	24	32	40	48	56	64	72	79	87	95	103	111	119	127	135	143	151	159
33°	8	16	25	33	41	49	57	65	74	82	90	98	106	114	123	131	139	147	155	163
34°	8	17	25	34	42	50	59	67	75	84	92	101	109	117	126	134	143	151	159	168
35°	9	17	26	34	43	52	60	69	77	86	95	103	112	120	129	138	146	155	163	172
36°	9	18	26	35	44	53	62	71	79	88	97	106	115	123	132	141	150	159	168	176
37°	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135	144	153	163	172	181
38°	9	18	28	37	46	55	65	74	83	92	102	111	120	129	139	148	157	166	175	185
39°	9	19	28	38	47	57	66	75	85	94	104	113	123	132	142	151	160	170	179	189
40°	10	19	29	39	48	58	68	77	87	96	106	116	125	135	145	154	164	174	183	193
41°	10	20	30	39	49	59	69	79	89	98	108	118	128	138	148	157	167	177	187	197
42°	10	20	30	40	50	60	70	80	90	100	110	120	130	140	151	161	171	181	191	201
43°	10	20	31	41	51	61	72	82	92	102	113	123	133	143	153	164	174	184	194	205
44°	10	21	31	42	52	63	73	83	94	104	115	125	135	146	156	167	177	188	198	208
45°	11	21	32	42	53	64	74	85	95	106	117	127	138	149	159	170	180	191	201	212
46°	11	22	32	43	54	65	76	86	97	108	119	129	140	151	162	173	183	194	205	216
47°	11	22	33	44	55	66	77	88	99	110	121	132	143	154	165	176	186	197	208	219
48°	11	22	33	45	56	67	78	89	100	111	123	134	145	156	167	178	190	201	212	223
49°	11	23	34	45	57	68	79	91	102	113	125	136	147	158	170	181	192	204	215	226
50°	11	23	34	46	57	69	80	92	103	115	126	138	149	161	172	184	195	207	218	230
51°	12	23	35	47	58	70	82	93	105	117	128	140	152	163	175	186	198	210	221	233
52°	12	24	35	47	59	71	83	95	106	118	130	142	154	165	177	189	201	213	225	236
53°	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204	216	228	240
54°	12	24	36	49	61	73	85	97	109	121	133	146	158	170	182	194	206	218	231	243
55°	12	25	37	49	61	74	86	98	111	123	135	147	160	172	184	197	209	221	233	246
56°	12	25	37	50	62	75	87	100	112	124	137	149	162	174	187	199	211	224	236	249
57°	13	25	38	50	63	75	88	101	113	126	138	151	164	176	189	201	214	226	239	252
58°	13	25	38	51	64	76	89	102	115	127	140	153	165	178	191	204	216	229	242	254
59°	13	26	39	51	64	77	90	103	116	129	141	154	167	180	193	206	219	231	244	257
60°	13	26	39	52	65	78	91	104	117	130	143	156	169	182	195	208	221	234	247	260

Example. A ship in latitude 39°51′. N., longitude 67°35′ W., by dead reckoning, obtains a radio bearing of 299° true on the radiobeacon located in latitude 40°37′. N., longitude 69°37′ W.

Radiobeacon station	Latitude	40°37′ N.
Dead-reckoning position of ship	Latitude	39°51′
Middle latitude		40°14′
Radiobeacon station	Longitude	69°37′ W.
Dead reckoning position of ship	Longitude	67°35′
Longitude difference		2°02′

Entering the table with difference of longitude equals 2°, which is the nearest tabulated value and opposite 40° middle latitude, the correction of 39′ is read.

As the ship is east of the radiobeacon, a minus correction is applied. The Mercator bearing then will be 299° − 000°39′ = 298°21′. To facilitate plotting, subtract 180° and plot from the position of the radiobeacon the bearing 298°21′ − 180°, or 118°21′ (Mercator bearing reckoned clockwise from true north).

Distance of Visibility of Objects at Sea

The following table gives the approximate geographic range of visibility for an object which may be seen by an observer whose eye is at sea level; in practice, therefore, it is necessary to add to these a distance of visibility corresponding to the height of the observer's eye above sea level.

Height, feet	Nautical miles	Height, feet	Nautical miles	Height, feet	Nautical miles	Height, feet	Nautical miles	Height, feet	Nautical miles
6	2. 8	48	7. 9	220	17. 0	660	29. 4	2, 000	51. 2
8	3. 1	50	8. 1	240	17. 7	680	29. 9	2, 200	53. 8
10	3. 6	55	8. 5	260	18. 5	700	30. 3	2, 400	56. 2
12	4. 0	60	8. 9	280	19. 2	720	30. 7	2, 600	58. 5
14	4. 3	65	9. 2	300	19. 9	740	31. 1	2, 800	60. 6
15	4. 4	70	9. 6	320	20. 5	760	31. 6	3, 000	62. 8
16	4. 6	75	9. 9	340	21. 1	780	32. 0	3, 200	64. 9
18	4. 9	80	10. 3	360	21. 7	800	32. 4	3, 400	66. 9
20	5. 1	85	10. 6	380	22. 3	820	32. 8	3, 600	68. 6
22	5. 4	90	10. 9	400	22. 9	840	33. 2	3, 800	70. 7
24	5. 6	95	11. 2	420	23. 5	860	33. 6	4, 000	72. 5
26	5. 8	100	11. 5	440	24. 1	880	34. 0	4, 200	74. 3
28	6. 1	110	12. 0	460	24. 6	900	34. 4	4, 400	76. 1
30	6. 3	120	12. 6	480	25. 1	920	34. 7	4, 600	77. 7
32	6. 5	130	13. 1	500	25. 6	940	35. 2	4, 800	79. 4
34	6. 7	140	13. 6	520	26. 1	960	35. 5	5, 000	81. 0
36	6. 9	150	14. 1	540	26. 7	980	35. 9	6, 000	88. 8
38	7. 0	160	14. 5	560	27. 1	1, 000	36. 2	7, 000	96. 0
40	7. 2	170	14. 9	580	27. 6	1, 200	39. 6	8, 000	102. 6
42	7. 4	180	15. 4	600	28. 0	1, 400	42. 9	9, 000	108. 7
44	7. 6	190	15. 8	620	28. 6	1, 600	45. 8	10, 000	114. 6
46	7. 8	200	16. 2	640	29. 0	1, 800	48. 6		

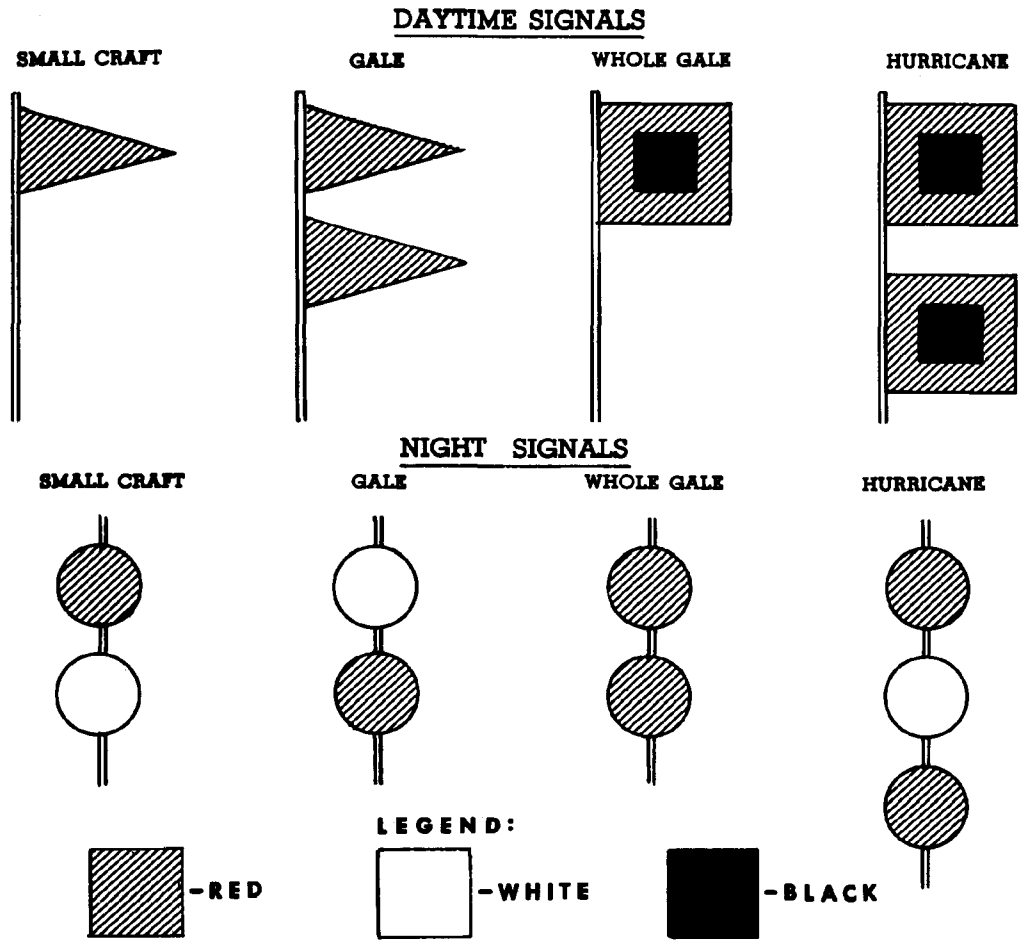
Conversion Table, Degrees to Points and Vice Versa

° ′	Points	° ′	Points	° ′	Points	° ′	Points
0 00	N	90 00	E	180 00	S	270 00	W
2 49		92 49		182 49		272 49	
5 38	N ½ E	95 38	E ½ S	185 38	S ½ W	275 38	W ½ N
8 26		98 26		188 26		278 26	
11 15	N x E	101 15	E x S	191 15	S x W	281 15	W x N
14 04		104 04		194 04		284 04	
16 53	N x E ½ E	106 53	ESE ½ E	196 53	S x W ½ W	286 53	WNW ½ W
19 41		109 41		199 41		289 41	
22 30	NNE	112 30	ESE	202 30	SSW	292 30	WNW
25 19		115 19		205 19		295 19	
28 08	NNE ½ E	118 08	SE x E ½ E	208 08	SSW ½ W	298 08	NW x W ½ W
30 56		120 56		210 56		300 56	
33 45	NE x N	123 45	SE x E	213 45	SW x S	303 45	NW x W
36 34		126 34		216 34		306 34	
39 23	NE ½ N	129 23	SE ½ E	219 23	SW ½ S	309 23	NW ½ W
42 11		132 11		222 11		312 11	
45 00	NE	135 00	SE	225 00	SW	315 00	NW
47 49		137 49		227 49		317 49	
50 38	NE ½ E	140 38	SE ½ S	230 38	SW ½ W	320 38	NW ½ N
53 26		143 26		233 26		323 26	
56 15	NE x E	146 15	SE x S	236 15	SW x W	326 15	NW x N
59 04		149 04		239 04		329 04	
61 53	NE x E ½ E	151 53	SSE ½ E	241 53	SW x W ½ W	331 53	NNW ½ W
64 41		154 41		244 41		334 41	
67 30	ENE	157 30	SSE	247 30	WSW	337 30	NNW
70 19		160 19		250 19		340 19	
73 08	ENE ½ E	163 08	S x E ½ E	253 08	WSW ½ W	343 08	N x W ½ W
75 56		165 56		255 56		345 56	
78 45	E x N	168 45	S x E	258 45	W x S	348 45	N x W
81 34		171 34		261 34		351 34	
84 23	E ½ N	174 23	S ½ E	264 23	W ½ S	354 23	N ½ W
87 11		177 11		267 11		357 11	

BEAUFORT SCALE OF WIND FORCE

Beaufort Number	Miles per Hour	Knots	Wind Effects Observed at Sea	Terms Used In U. S. W. B. Forecasts
0	Less than 1	Less than 1	Sea like a mirror	Light
1	1- 3	1- 3	Ripples with the appearance of scales formed, but without foam crests	
2	4- 7	4- 6	Small wavelets, short but pronounced; crests appear glassy, do not break	
3	8-12	7-10	Large wavelets with crests beginning to break; foam appears glassy. Perhaps scattered white horses (white foam crests).	Gentle
4	13-18	11-16	Small waves, becoming longer; fairly frequent white horses	Moderate
5	19-24	17-21	Moderate waves of a pronounced long form; many white horses, possibly some spray.	Fresh
6	25-31	22-27	Large waves begin to form; white foam crests more extensive everywhere; probably some spray.	Strong
7	32-38	28-33	Sea heaps up; some white foam from breaking waves blows in streaks along the direction of the wind.	
8	39-46	34-40	Moderately high waves. Edges of crests begin to break into spindrift. Well-marked streaks of foam blow along direction of wind.	Gale
9	47-54	41-47	High waves. Dense streaks of foam along direction of wind. Spray may affect visibility.	
10	55-63	48-55	Very high waves with long overhanging crests; great patches of foam blown in dense white streaks along direction of wind. Sea surface takes on a white appearance. Visibility affected.	Whole gale
11	64-72	56-63	Exceptionally high waves; sea completely covered with long white patches of foam lying along direction of wind; edges of wave crests everywhere blown into froth. Visibility affected.	
12 or more	73 or more	64 or more	Air filled with foam and spray; sea completely white with driving spray. Visibility very seriously affected.	Hurricane

SMALL CRAFT, GALE, WHOLE GALE AND HURRICANE WARNINGS



EXPLANATION OF DISPLAY SIGNALS

SMALL CRAFT WARNING: One red pennant displayed by day and a red light above a white light at night to indicate winds up to 33 knots and/or sea conditions dangerous to small craft operations are forecast for the area.

GALE WARNING: Two red pennants displayed by day and a white light above a red light at night to indicate winds ranging from 34 to 47 knots are forecast for the area.

WHOLE GALE WARNING: A single square red flag with a black center displayed during daytime and two red lights at night to indicate winds ranging from 48 to 63 knots are forecast for the area.

HURRICANE WARNING: Two square red flags with black centers displayed by day and a white light between two red lights at night to indicate that winds 64 knots and above are forecast for the area.

Blank page retained for pagination

INDEX

Number in parentheses immediately following any item in this Index is number of the largest scale United States Coast and Geodetic Survey chart on which that feature appears.

	Page
Abalone Point (5602)	142
Abbey Islet (6102)	182
Aberdeen (6195)	180
Abernathy Point (6152)	168
Active Cove (6380)	194
Active Pass (6380)	195
Adams Bay (4181)	266
Adams Cove (5116)	112
Admiralty Bay (6450)	208
Admiralty Head (6450)	192
Admiralty Inlet (6450)	208
Advance notice of arrival of vessels in port	13, 86
Agate Bay (6382)	190
Agate Passage (6445)	219
Agate Point (6445)	219
Ahihi Bay (4130)	243
Ahole Rock (4116)	242
Ahukini Landing (4112)	264
Aids to Navigation	86
Aircraft assistance procedures	7
Akokoa Point (4140)	233
Ala Spit (6376)	201
Ala Wai Boat Harbor (4132)	254
Alala Point (4110)	259
Alalakeiki Channel (4130)	247
Alameda (5535)	129
Alamitos Bay (5148)	97
Alapii Point (4100)	262
Alau Island (4116)	242
Albany (6172)	172
Albert Head (6382)	188, 189
Albion (5711)	141
Albion Cove (5711)	140
Albion River (5711)	141
Alcatraz Island (5535)	126
Alden Bank (6380)	201
Alden Point (6380)	194
Alder Creek (5302)	117
Alealea Point (4103)	234
Aleck Bay (6380)	199
Alenuihaha Channel (4115)	240
Alexander Island (6102)	182
Alki Point (6449)	211
Allan Island (6376)	200
Allegany (5984)	156
Allyn (6460)	227
Aloha Tower (4109)	254
Alsea Bay (6056)	158
Aluea Rock (4116)	246
Alviso (5531)	129
Alviso Slough (5531)	129
Amphitrite Point (6102)	184
Anacapa Island (5114)	109
Anacapa Passage (5114)	110
Anacortes (6376)	202
Anaheim Bay (5148)	97
Anahola Bay (4100)	264
Anahulu River (4110)	257
Anchorage (see also name of place)	86
Anchorage areas	8
Anchorage regulations	14
Anderson Cliff (5602)	142
Anderson Cove, Hood Canal (6460)	218
Anderson Cove, Port Washington Narrows (6446)	221
Anderson Island (6460)	225
Angel Island (5532)	130
Angeles Point (6382)	191
Anita Rock (5535)	127
Annapolis (6440)	220
Annas Bay (6460)	218
Annexation Hill (4181)	267
Antioch (5576)	133
Antioch Bridge (5527)	134
Apole Point (4116)	242
Apple Cove Point (6445)	209
Appletree Cove (6445)	209
Aptos Creek (5403)	121
Apua Point (4115)	235
Aquatic Park (5535)	128
Arcadia (6461)	228
Arcata (5832)	146
Arcata Bay (5832)	146
Arch Cape (5902)	162
Arch Rock (5114)	109
Arena Cove (5502)	139
Arena Rock (5502)	140
Argyle (6380)	196
Argyle Shoal (6380)	196
Arlington (6160)	174
Army Point (5574)	133
Arroyo San Onofre (5101)	96
Astoria (6151)	167
Atlas Rock (5386)	115
Atolls (4000)	266
Auau Channel (4130)	247
Austin Point (6154)	169
Avalon (5128)	107
Avalon Bay (5128)	107
Avila Beach (5386)	114
Avon (5574)	133
Baada Point (6266)	190
Bachelor Island (6154)	169
Bainbridge Reef (6446)	219
Baker Bay (6151)	166
Balboa (5108)	96
Balch Passage (6460)	224
Bald Hill (5703)	142
Bald Islets (6102)	183
Bald Mountain (5951)	152
Ballast Point, San Diego (5128)	108
Ballast Point, Santa Catalina Island (5105)	94
Ballenas Islands (6300)	206
Baltimore Rock (5984)	155
Bandon (5971)	154
Bangor (6422)	217
Barbers Point (4133)	256
Bare Island (6380)	194
Barkley Sound (6102)	184
Barking Sands (4100)	262
Barlow Bay (6380)	196

691-231 O—63——20

	Page
Barnabie Point (6449)	213
Barnes Island (6380)	201
Barren Island (6379)	194
Barview (5984)	156
Bat Rock (5116)	112
Bathhouse Point (5128)	107
Battery Point (5895)	149
Battle Point (6445)	219
Battle Rock (5952)	153
Battleship Island (6379)	194
Bay Center (6185)	178
Bay City, Grays Harbor (6195)	180
Bay City, Tillamook Bay (6112)	162
Bay City Channel (6112)	161
Beacon Reef (5115)	111
Bear Harbor Ridge (5602)	143
Bear River (6185)	178
Bearings	1
Beaufort scale	296
Beaver Slough (6152)	168
Bechers Bay (5115)	111
Beck Cove (4130)	247
Bee (6460)	225
Bee Rock (5116)	111
Beechey Head (6382)	188
Begg Rock (5113)	108
Bell Island (6379)	197
Belle Chain Islets (6380)	206
Belle Rock (6380)	200
Bellevue Point (6380)	193
Bellingham (6378)	203
Bellingham Bay (6378)	203
Bellingham Channel (6378)	202
Bells Mountain (5602)	142
Belmont Shore (5148)	97
Belvedere Cove (5532)	130
Ben Ure Island (6376)	199
Benicia (5574)	133
Bensaleux Reef (4183)	272
Bentinck Island (6382)	188
Berkeley (5532)	129
Berkeley Yacht Harbor (5532)	129
Big Flat (5602)	143
Big Lagoon (5702)	148
Big Quilcene River (6450)	218
Big River (5711)	141
Big Sur River (5476)	118
Big White Rock (5602)	142
Biggs Bridge (6158)	174
Biggs Junction (6158)	174
Bingen (6157)	173
Birch Bay (6300)	204
Birch Point (6300)	204
Bird Island (4175)	270
Bird Rock, Cape San Martin (5302)	117
Bird Rock, San Juan Channel (6379)	197
Bird Rock, Santa Catalina Island (5128)	108
Bird Rocks (6380)	200
Bishop Rock (5101)	106
Bit Rock (5144)	100
Bixby Landing (5476)	119
Black Rock, Cape Blanco (5952)	153
Black Rock, Rosario Strait (6380)	200
Blacklock Point (5952)	154
Blaine (6399)	205
Blake Island (6446)	221
Blakely Harbor (6446)	211
Blakely Island (6380)	198
Blakely Rock (6446)	211
Blalock Island (6161)	174
Blalock Rapids (6159)	174
Blanco Reef (5952)	153
Blank Rock (5846)	147
Blind Bay (6379)	198
Blind Island (6379)	198
Blonde Reef (4103)	234
Blowers Bluff (6450)	216
Bluff Cove (5144)	100
Blunts Reef (5795)	144
Boardman (6161)	174
Bodega Bay (5603)	138
Bodega Bay (town) (5603)	138
Bodega Harbor (5603)	138
Bodega Head (5603)	138
Bodega Rock (5603)	138
Bodelteh Islands (6265)	183
Bolinas Bay (5532)	124
Bolinas Lagoon (5532)	124
Bolinas Point (5599)	124
Bolon Island (6004)	157
Bonilla Point (6300)	188
Bonita Channel (5532)	125
Bonita Cove (5532)	124
Bonneville (6156)	173
Bonneville Dam (6156)	173
Bosley Butte (5896)	151
Boston Harbor (6462)	227
Boulder Reef (6380)	201
Boundary Bay (6300)	205
Boundary Bluff (6300)	205
Boundary lines of Inland Waters	12, 86
Boundary Pass (6380)	195
Bourns Landing (5502)	139
Bowerman Airport (6195)	180
Brackenridge Bluff (6195)	179
Bradbury Slough (6152)	168
Bradford Island (6156)	173
Breaker Point (5302)	117
Bremerton (6440)	220
Bridge of the Gods (6157)	173
Bridge regulations	30
Bridges	1
Brighton (6122)	162
Brinnon (6450)	218
Brisco Point (6462)	227
Brockway Point (5115)	111
Broken Point (6379)	198
Brookings (5896)	151
Brooks Banks (4182)	268
Brotchie Ledge (6380)	189
Brothers, The; Cape Mendocino (5795)	144
Brothers, The; San Francisco Bay (5532)	130
Brown Island (6379)	196
Brown Rock (5895)	149
Browns Bay (6450)	214
Browns Point Light (6407)	223
Brownsville (6445)	219
Brushy Bald Mountain (5951)	152
Buchmans Landing (6172)	171
Buck Bay (6380)	198
Buckeye Shoal (6380)	200
Bucksport (5832)	146
Budd Inlet (6462)	227
Buena Vista (6172)	172
Buhne Point (5832)	145
Bull Rock (5711)	140
Bulls Head Point (5574)	133
Buoys	4
Burbank (6164)	175
Burke Bay (6445)	219
Burke Island (6153)	168
Burke Slough (6153)	169
Burley Lagoon (6460)	225
Burns Point (6460)	228
Burrard Inlet (6300)	206
Burrows Bay (6376)	200

	Page
Burrows Island (6376)	200
Burton (6460)	222
Burton Peninsula (6460)	222
Bush Point (6450)	208
Butteville (6172)	171
Cables	1
Cabrillo National Monument (5105)	94
Cadboro Point (6380)	195
Cahto Peak (5602)	142
Cake Rock (6102)	183
Calaveras Point (5531)	128
California State Maritime Academy (5534)	132
Camano (6450)	215
Camano Head (6448)	215
Camano Island (6450)	215
Camas (6156)	172
Camas Slough (6156)	172
Cambria (5302)	116
Cambria Rock (5302)	116
Camp Del Mar Boat Basin (5101)	96
Can Rock (5116)	112
Candlestick Point (5531)	128
Cannery Hill (6023)	157
Cannon Beach (5902)	163
Canoe Island (6379)	198
Canoe Pass (6376)	199
Cape Alava (6265)	183
Cape Arago (5802)	154
Cape Beale (6102)	184
Cape Blanco (5952)	153
Cape Disappointment (6151)	164
Cape Elizabeth (6002)	181
Cape Falcon (5902)	162
Cape Ferrelo (5896)	151
Cape Flattery (6265)	184
Cape Foulweather (6056)	159
Cape George (6403)	192
Cape Halawa (4130)	250
Cape Hanamanioa (4130)	243
Cape Horn, Columbia River; near Multnomah Falls (6156)	173
Cape Horn, Columbia River; near Puget Island (6152)	168
Cape Johnson (6102)	183
Cape Kinau (4130)	243
Cape Kiwanda (5902)	160
Cape Kuikui (4130)	247
Cape Kumukahi Light (4115)	235
Cape Lookout (5902)	161
Cape Meares (6112)	161
Cape Mendocino (5795)	144
Cape Perpetua (5802)	158
Cape St. Mary (6380)	200
Cape San Martin (5302)	117
Cape Sebastian (5951)	152
Cape Shoalwater (6185)	177
Cape Vizcaino (5602)	142
Capitan (5202)	104
Capitola (5403)	121
Capsante Waterway (6376)	202
Cardwell Point (5116)	111
Carillon, The (5128)	107
Carlsbad (5101)	96
Carlyon Beach (6460)	228
Carmanah Point (6102)	184
Carmel (5476)	119
Carmel Bay (5476)	119
Carmel Canyon (5476)	119
Carmel Cove (5476)	119
Carmel Point (5476)	119
Carmel River (5476)	119
Carpinteria (5202)	103
Carquinez Strait (5534)	132
Carr Inlet (6460)	225
Carrington Point (5115)	111
Carroll Islet (6102)	183
Carrolls Channel (6153)	169
Carter Point, Bellingham Bay (6378)	201, 203
Carter Point, Nawiliwili Bay (4111)	260
Cascade Bay (6380)	198
Cascade Head (5902)	160
Cascade Locks (6157)	173
Cascade Range (6156)	173
Case Inlet (6460)	226
Case Shoal (6421)	217
Casino Point (5128)	107
Casket Rock (5703)	140
Caspar (5711)	141
Caspar Anchorage (5711)	141
Caspar Creek (5711)	141
Castle Rock, Arch Cape (5902)	162
Castle Rock, Cape Blanco (5952)	154
Castle Rock, Crescent City (5895)	149
Castle Rock, San Clemente Island (5118)	107
Castle Rock, San Miguel Island (5116)	112
Castro Rocks (5532)	130
Cat Rock (5114)	110
Catalina Harbor (5128)	108
Catching Slough (5984)	156
Cathlamet (6152)	168
Cathlamet Bay (6151)	167
Cathlamet Channel (6152)	168
Cattle Point (6380)	195
Cayucos (5387)	116
Cayucos Point (5387)	116
Center Island (6380)	199
Center Reef (6379)	194
Centerville Beach (5602)	145
Central Basin (5535)	128
Central Ferry	175
Cerantes Rocks (6300)	188
Chambers Creek (6460)	226
Channel Islands (5020)	106
Channel Islands National Monument (5101)	109
Channel Street (5535)	128
Charles Island (6380)	196
Charleston (5984)	156
Charts	2
Chase Ledge (5895)	149
Chehalis River (6195)	180
Cherry Point (6380)	204
Chetco Cove (5896)	151
Chetco River (5896)	151
Chico (6446)	221
Chico Bay (6446)	221
Chimney Rock (5599)	124
China Basin (5535)	128
China Point (5117)	106
Chinese Harbor (5114)	110
Chinook (6151)	166
Christmas Rock (5795)	144
Chuckanut Bay (6378)	203
Chula Vista (5107)	93
City of Refuge (4123)	238
City of Seattle Rock (6376)	202
City Waterway (6407)	223
Clallam Bay (6300)	190
Clallam Bay (tower) (6300)	190
Clark Island (6380)	201
Clark Point (6378)	203
Clarksburg (5528)	136
Clatskanie River (6152)	168
Clatsop Spit (6151)	164
Cleawox Lake (5802)	157
Clements Reef (6380)	195

	Page
Cliff House (5502)	123
Cliff Island (6379)	197
Climatological tables	279
Clinton (6448)	214
Clo-oose (6102)	184
Clover Point (6380)	189
Cluster Cone Rock (5602)	143
Coal Creek Slough (6153)	168
Coal Oil Point (5202)	104
Coalbank Slough (5984)	156
Coast and Geodetic Survey	1, 273
Coast Eddy Current	125
Coast Guard	3, 275
Coast Pilots	273, 275
Cocoanut Island (4103)	234
Cojo Anchorage (5202)	104
Colby Reef (5711)	141
Cole Island (6380)	189
Cole Point (6460)	226
Colebrooke Butte (5951)	152
Columbia City (6153)	169
Columbia River (5022)	164
Columbia River Datum	165
Columbia River Gorge (6156)	172
Columbia Slough (6155)	170
Colville Island (6380)	199
Colvos Passage (6460, 6446)	222
Colvos Rocks (6421)	209
Commencement Bay (6407)	223
Commission of Public Docks, Portland	170
Compass roses on charts	2
Cone Islands (6378)	203
Cone Peak (5302)	117
Cone Rock, off Prince Island (5896)	150
Cone Rock, off Trinidad Head (5702)	148
Conical Rock (5795)	144
Constance Bank (6382)	189
Constantine Rock (5387)	116
Control over movement of vessels	13, 86
Conversion table, degrees to points	295
Cook (6157)	173
Cooks Monument (4123)	238
Coon Island (6379)	197
Cooper Point, Budd Inlet (6462)	228
Cooper Point, Point Sur (5476)	118
Coos Bay (5984)	155
Coos Bay (City) (5984)	156
Coos Head (5984)	155
Coos River (5984)	156
Cooskie Creek (5602)	143
Copalis Head (6002)	180
Copalis River (6002)	180
Copalis Rocks (6002)	180
Copeleys Rock (6171)	171
Coquille (5971)	154
Coquille Point (5971)	154
Coquille River (5971)	154
Coquille Rock (5971)	154
Corbett (6156)	173
Cordell Bank (5502)	123
Cormorant Passage (6460)	226
Cornet Bay (6376)	199
Corona Del Mar (5108)	96
Coronado (5105)	93
Coronado Islands (5101)	93
Corps of Engineers, U.S. Army	8, 275
Corte Madera Creek (5532)	131
Cortes Bank (5101)	106
Corvallis (6172)	172
Cosmopolis (6195)	180
Cottaneva Needle (5602)	142
Cottaneva Rock (5602)	142
Cottonwood Island (6153)	168
Coupeville (6450)	216
Courses	1
Courtland (5528)	136
Cove (6460)	222
Cowlitz Bay (6380)	194
Cowlitz River (6153)	169
Cox Rock (5802)	158
Coxcomb Hill (6151)	166
Coyote Creek (5531)	128
Coyote Point (Point San Mateo) (5531)	128
Crane Island (6379)	197
Crates Point (6157)	173
Creosote (6446)	211
Crescent Bay (6382)	190
Crescent City (5895)	149
Crescent City Harbor (5895)	149
Crescent Harbor (6404)	216
Crescent Rock (6382)	190
Crims Island (6152)	168
Crockett (5534)	132
Crook Point, Mack Arch Point (5896)	152
Crook Point, San Miguel Island (5116)	112
Cuffey Cove (5703)	140
Cuffey Inlet (5703)	140
Cultus Bay (6450)	209
Currents (see also name of place)	1, 87
Cushman (6023)	157
Customs Districts	276
Cutts Island (6460)	225
Cuyler Harbor (5116)	112
Cypress Island (6380)	200
Cypress Reef (6380)	200
Dabob Bay (6450)	218
Dallas Bank (6403)	192
Dalles, The (6157)	173
Dalles Dam, The (6158)	174
Dana Passage (6462)	227
Dana Point (5101)	96
Danger Rock (6380)	197
Danger Shoal (6379)	194
Danger signals	6
Danger zone regulations	53
Dangers	86
Dash Point (6407)	223
Davenport (5402)	121
Davidson Rock (6380)	199
Davis Point, San Juan Channel (6380)	196
Davis Point, San Pablo Bay (5533)	131
Davis Slough (6450)	215
Daylight saving time	92
Days Island Anchorage (6460)	224
Days Island Lagoon (6460)	224
Dayton (6172)	171
Deadheads	166
Deadman Island	196
Decatur (6380)	199
Decatur Head (6380)	200
Decatur Island (6380)	199
Decatur Reef (6446)	211
Deception Island (6376)	199
Deception Pass (6376)	199
Decker Island (5527)	135
Deep River (6151)	168
Deer Harbor (6379)	197
Deer Harbor (village) (6379)	197
Del Mar, near San Diego (5101)	96
Del Mar, Santa Cruz (5403)	121
Delgada Canyon (5602)	143
Dellwood (5984)	156
Dennis Shoal (6376)	200
Depoe Bay (6056)	159

	Page
Depoe Bay (town) (6056)	160
Depot Slough (6055)	159
Depth units	1
Depths	86
Descanso Bay (5128)	108
Desdemona Sands (6151)	166
Destruction Island (6002)	182
Destructive waves	11
Deviation of the compass	3
Devils Gate Rock (5795)	144
Devils Head (6460)	226
Devils Lake (5902)	160
Devils Slide (5402)	122
Dewatto (6460)	218
Dewatto Bay (6460)	218
Diamond Head (4131)	254
Diamond Point (6403)	192
Dibblee Point (6153)	168
Dinner Island (6380)	196
Discovery Island (6380)	189
Distance tables	288
Distances	1
District offices, C&GS	1, 273
Dockton (6460)	222
Doe Bay (6380)	201
Doebay (6380)	201
Dofflemyer Point (6462)	227
Dolan Cone (5302)	118
Dolphin Point (6446)	221
Dosewallips River (6450)	218
Double Bluff (6450)	209
Double Cone Rock (5602)	142
Double Island (6379)	198
Double Peak (5902)	163
Double Point (5599)	124
Dragon Channel (5895)	150
Drakes Bay (5599)	124
Drano Lake (6157)	173
Drayton Harbor (6399)	205
Drayton Passage (6460)	225
Dtokoah Point (6266)	190
Duck Club (6154)	169
Dumas Cove (6460)	222
Dumbarton Bridge (5531)	128
Dumbarton Point (5531)	128
Dume Canyon (5101)	102
Duncan Rock (6265)	184
Duncans Landing (5502)	138
Dungeness (6382)	192
Dungeness Bay (6382)	191
Dungeness Spit (6382)	191
Duntze Rock (6265)	184
Duwamish Waterway (6449)	212
Duxbury Point (5599)	124
Duxbury Reef (5599)	124
Dyes Inlet (6446)	221
Eagle Creek (6157)	173
Eagle Harbor (6446)	211
Eagle Island (6460)	225
Eagle Island Reef (6460)	225
Eagle Point (6380)	193
Eagle Reef (5128)	108
Eagledale (6446)	211
East Bremerton (6440)	220
East Brother Island Light (5532)	130
East Fish Camp (5114)	110
East Island (4171)	267
East Loch (4110)	256
East Pasco (6164)	175
East Passage (6460, 6446)	221
East Point, Santa Rosa Island (5115)	111
East Point, Saturna Island (6380)	195
East Point, Whidbey Island (6450)	215
East Rock (5895)	150
East Seattle (6449)	213
East Waterway (6449)	212
Eastern Island (4188)	271
Eastsound (6380)	198
Eaton's Ranch	178
Ebey Slough (6448)	215
Echo Bay (6380)	195
Echo soundings	2
Edith Point (6380)	206
Ediz Hook (6303)	191
Edmonds (6445)	210
Edwards Point (6445)	210
Eel Canyon (5602)	145
Eel River (5602)	145
El Estero (5202)	103
El Segundo (5144)	101
Eld Inlet (6460)	228
Eldon (6460)	218
Elevations	1
Elger Bay (6450)	215
Eliza Island (6378)	203
Eliza Rock (6378)	203
Elk (5703)	140
Elk Creek (5902)	163
Elk River, Cape Blanco (5952)	153
Elk River, Grays Harbor (6195)	180
Elk Rock (5602)	140
Elliot Point (6448)	214
Elliott Bay (6449)	211
Ellis Slough (6185)	178
Elma (6195)	180
Elochoman Slough (6152)	168
Elwha River (6382)	191
Elwood Point (6446)	221
Embarcadero (5105)	94
Emergency broadcasts	10
Emeryville (5532)	129
Empire (5984)	156
English Bluff (6300)	205
Enterprise Reef (6380)	195
Entrance Island (6300)	206
Enuhe Ridge (4115)	236
Espada Bluff (5202)	104
Esquimalt Harbor (6380)	189
Estero Bay (5387)	115
Eureka (5832)	146
Eureka Slough (5832)	146
Everett (6448)	214
Ewa (4133)	256
Fair Harbor (6460)	227
Fairhaven (5832)	146
Fairway Channel (6300)	206
Falcon Rock (5902)	162
False Cape (5795)	145
False Cape Rock (5795)	145
False Klamath Rock (5702)	149
False Point (5101)	95
False Sur (5476)	118
Fanny Shoal (5598)	123
Farallon Islands (5598)	123
Farnsworth Bank (5112)	107
Father and Son (6265)	183
Fauntleroy Cove (6446)	221
Fauntleroy Point (6380)	199
Fawn Island (6379)	197
Feather River (5529, 5530)	137
Federal Communications Commission	277
Ferndale (6380)	204
Ferry Building (5535)	127
Fidalgo Bay (6376)	202

	Page
Fidalgo Head (6376)	200
Fidalgo Island (6376)	199
Fields Landing (5832)	146
Filucy Bay (6460)	225
Fisgard Island (6382)	189
Fish Harbor (5147)	98
Fish Havens	8
Fish Rocks (5502)	139
Fishboat Harbor (5895)	149
Fisher Island (6153)	168
Fisher Island Slough (6153)	168
Fisherman Bay, Farallon Islands (5598)	123
Fisherman Bay, Lopez Island (6380)	196
Fisherman Bay, north of Bodega Head (5502)	139
Fisherman Cove (5128)	108
Fisherman Harbor (6450)	218
Fisherman's Wharf (5535)	128
Fishtraps	8
Fisk Mill Cove (5502)	139
Five Needles (4120)	249
Fivemile Point (5802)	154
Flat Point (6379)	198
Flat Rock, Grays Harbor (6002)	181
Flat Rock, Palos Verdes Point (5144)	100
Flat Rock, St. George Reef (5895)	150
Flat Rock, Trinidad Harbor (5846)	147
Flat Rock Point (5144)	100
Flattery Rocks (6265)	183
Flattop Island (6379)	197
Fletcher Bay (6446)	220
Flint Rock Head (5702)	148
Florence (6023)	157
Flounder Bay (6376)	200
Fog	90
Fog signals	1, 4
Fog signals operation tables	286
Forbes Point (6404)	216
Forney Cove (5115)	110
Fort Armstrong (4109)	255
Fort Bragg (5703)	142
Fort Columbia State Park (6151)	166
Fort Point (5532)	125
Fort Ross (5502)	139
Fort Ross Cove (5502)	139
Fort Ross Reef (5502)	139
Fort Stevens (6151)	166
Fort Ward (6446)	220
Fossil Bay (6380)	195
Foulweather Bluff (6421)	209
Fourmile Rock (6449)	211
Fox Island (6460)	224
Fox Rock (5952)	153
Fragaria (6460)	222
Franklin D. Roosevelt Lake (6168, 6169)	175
Fraser Point (5115)	110
Fraser River (6300)	205
Freeland (6450)	215
Freeport (5528)	136
French Frigate Shoals (4171, 4172)	267
Freshwater Bay (6382)	191
Friday Harbor (6379)	196
Friday Harbor (town) (6379)	196
Fuca Pillar (6265)	184
Fulton Creek (6450)	218
Gabriola Pass (6300)	206
Gabriola Reefs (6300)	206
Galiano Island (6300)	206
Gambia Shoal (4183)	271
Garcia River (5602)	140
Gardiner (6004)	157
Gardner Pinnacles (4173)	268
Garibaldi (6112)	161
Garrison Bay (6379)	193
Garry Point (6300)	206
Gaviota (5202)	104
Gaviota Canyon (5202)	104
Gedney Island (6448)	214
Geographic names, Hawaii	229
Georgiana Slough (5527)	135
Gertrude (6460)	225
Gertrude Island (6460)	225
Giants Graveyard (6102)	182
Gibson Point (6460)	225
Gifford (6169)	176
Gig Harbor (6460)	222
Gig Harbor (town) (6460)	222
Glen Cove (6405)	208
Glenada (6023)	157
Glencove (6460)	225
Glendale (6450)	214
Glorietta Bay (5105)	95
Goat Island, Chetco Point (5896)	151
Goat Island, Swinomish Channel (6376)	201
Goat Islet (6382)	188
Gold Beach (5951)	152
Gold Bluffs (5702)	148
Golden Gate (5532)	124
Golden Gate Bridge (5532)	125
Goleta (5261)	104
Goleta Point (5202)	104
Gonzales Point (6380)	189
Goose Island (6380)	196
Goose Point (6185)	178
Gorda Rock (5795)	144
Gordon Hill (5602)	142
Government Cove (6157)	173
Gowlland Point (6380)	195
Grand Coulee Dam (6168)	175
Grant (6460)	226
Grapeview (6460)	226
Grave Island (6460)	225
Graveyard Point, Coos River (5984)	156
Graveyard Point, Port Orford (5952)	153
Grays Bay (6151)	168
Grays Harbor (6195)	179
Grays Point (6151)	168
Grays River (6151)	168
Great Bend, The (6460)	218
Great Break (5895)	150
Great Crack (4115)	236
Green Hill (6112)	161
Green Island (4177)	272
Green Rock (5702)	148
Greenbank (6450)	215
Grenville Arch (6002)	181
Gualala (5502)	139
Gualala Mountain (5502)	139
Gualala Point (5502)	139
Gualala River (5502)	139
Guano Rock (5984)	155
Guemes Channel (6376)	202
Gulf of the Farallones (5502)	123
Gull Island, Columbia River (6152)	168
Gull Island, Santa Cruz Island (5115)	110
Gull Rock, Bodega Head (5502)	138
Gull Rock, Cape Blanco (5952)	154
Gull Rock, Flattop Island (6379)	197
Gull Rock, north of Yaquina Head (6056)	159
Gunther Island (5832)	146
Hackney Island (6450)	215
Hadlock (6405)	208
Haena Caves (4118)	263
Haena Point (4118)	263
Haines Wharf (6450)	214

	Page
Hakalau Bay (4115)	234
Hakalau Gulch (4115)	234
Hakuhee Point (4124)	245
Hakuma Point (4115)	235
Halaula (4140)	233
Halawa (4130)	252
Halawa Bay (4130)	252
Hale Passage, Bellingham Bay (6378)	203
Hale Passage, Carr Inlet (6460)	224
Haleakala (4116)	241
Haleili (4115)	237
Haleiwa (4110)	257
Haleolono Point (4120)	251
Half Moon Bay (5520)	122
Halona Point (4130)	247
Hamilton Beach (5128)	108
Hamma Hamma River (6460)	218
Hammersley Inlet (6461)	228
Hammond (6151)	166
Hana (4113)	241
Hana Airport (4116)	247
Hana Bay (4113)	241
Hanakaoo Point (4130)	244
Hanalei (4118)	263
Hanalei Bay (4118)	263
Hanalei River (4118)	263
Hanamalo Point (4115)	237
Hanamanioa Light (4130)	243
Hanamaulu Bay (4112)	264
Hanamaulu Stream (4112)	264
Hanapepe Bay (4108)	261
Hanauma Bay (4131)	253
Hanbury Point (6379)	193
Hand Rock (6102)	183
Hansville (6450)	209
Harbor Center (6450)	215
Harbor Island (5105)	95
Harbor Reefs (5128)	108
Harbor Rock, Griffin Bay (6380)	196
Harbor Rock, West Sound, Orcas Island (6379)	198
Hardy Rock (5602)	142
Harlan Rock (5302)	117
Harlech Castle Rock (5302)	117
Harney Channel (6379)	198
Haro Strait (6380)	193, 195
Harper (6446)	221
Harrington Point (6151)	168
Harris Point (5116)	112
Hartstene Island (6460)	226
Hat Island (6448)	214
Hauakea Pali (4120)	252
Hauola Gulch (4130)	249
Haupu (4100)	259
Hauula (4110)	258
Havens Anchorage (5502)	139
Havens Neck (5502)	139
Hawaii (4000)	229
Hawaii Island (4115)	232
Hawaiian Archipelago (4000)	229
Hawea Point Light (4130)	244
Hayden Island (6155)	172
Haynes Inlet (5984)	156
Haystack Rock, Cape Kiwanda (5902)	160
Haystack Rock, Tillamook Head (5902)	163
Hazel Point (6450)	218
Heads, The (5952)	153
Hearst Castle (5302)	116
Heceta Bank (5802)	158
Heceta Head (5802)	157
Heeia (4134)	258
Hein Bank (6380)	189
Hekili Point (4130)	244
Henderson Inlet (6460)	226
Henry Island (6379)	193
Hermosa Beach (5144)	101
Herron (6460)	226
Herron Island (6460)	226
High Bluff (5702)	148
Hilea (4115)	236
Hilo (4103)	234
Hilo Bay (4103)	234
Hoalua Bay (4116)	246
Hoanuanu Bay (4114)	262
Hoh Head (6102)	182
Hoh River (6102)	182
Hokukano (4116)	243
Hole in the Wall (6376)	201
Hollister Peak (5387)	115
Holly (6460)	218
Hollywood by the Sea (5007)	102
Holmes Harbor (6450)	215
Home (6460)	225
Home Valley (6157)	173
Honaunau Bay (4123)	238
Honohina (4115)	234
Honokaa (4162)	233
Honokala Point (4116)	246
Honokaneiki Gulch (4115)	233
Honokoa Gulch (4167)	240
Honokohau (4130)	244
Honokohau Stream (4130)	245
Honolua Bay (4130)	244
Honolulu (4109)	254
Honolulu Entrance Channel (4109)	254
Honolulu Harbor (4109, 4132)	254
Honolulu International Airport (4132)	255
Honomanu Bay (4116)	246
Honomu (4115)	234
Honoulimaloo (4130)	250
Honouliwai (4130)	250
Honuapo Bay (4162)	236
Hood Canal (6401)	216
Hood Head (6421)	217
Hood River (6157)	173
Hoodsport (6460)	218
Hookena (4115)	238
Hoopuloa (4115)	237
Hope Island, Skagit Bay (6376)	201
Hope Island Squaxin Passage (6460)	228
Hoquarten Slough (6112)	162
Hoquiam (6195)	180
Hoquiam River (6195)	180
Horsehead Bay (6460)	225
Horseshoe Bay (5532)	130
Horseshoe Point (5502)	139
Houghton (6449)	213
Howell Rock (5386)	115
Hoypus Point (6376)	200
Huelo (4116)	246
Huelo Point (4116)	246
Hueneme Canyon (5202)	113
Hug Point (5902)	163
Huleia Stream (4111)	260
Hulu Islets (4124)	245
Humboldt Bar (5832)	145
Humboldt Bay (5832)	145
Humbug Mountain (5951)	153
Hump Rock (5895)	149
Hunot Point (6376)	201
Hunter Creek (5951)	152
Hunter Rock (5896)	150
Hunters Cove (5896)	152
Hunters Island (5896)	152
Hunters Point (5535)	128
Hunting Island (6152)	168
Huntington Beach (5142)	97

	Page
Huntington Beach State Park (5142)	97
Huntington Harbor (5148)	97
Hurst Shoal (5598)	123
Hyde Point (6460)	225
Hylebos Waterway (6407)	223
Iao Valley (4124)	245
Ice Harbor Dam (6164)	175
Iceberg Point (6380)	195
Ida Island (5527)	136
Ilio Point (4120)	252
Illahee (6446)	220
Illahee State Park (6446)	220
Ilwaco (6151)	166
Imola (5533)	132
Immigration and Naturalization	9, 277
Imperial Eagle Channel (6102)	184
Inchelium (6169)	176
Independence (6172)	172
Indian Cove (6379)	198
Indian Island (6405)	208
Indian Village (6421)	217
Indianola (6445)	210
Inner Pinnacle Rock (4113)	241
International Boundary (6300)	204
Invincible Rock (5532)	130
Ione Reef (6156)	172
Iron Mountain (6056)	159
Irondale (6405)	208
Islais Creek (5535)	128
Island Knob (5602)	142
Island Rock (5952)	153
Isleton (5527)	136
Isthmus Cove (5128)	108
Isthmus Slough (5984)	156
Itsami Ledge (6460)	226
Iwiopele (4116)	242
Jackson Pinnacle (5602)	142
Jagged Islet (6102)	183
James Bay (6380)	189
James Island, Decatur Head (6380)	200
James Island, Quillayute River (6102)	182
Jenner (5502)	138
Jetty (6122)	162
Joe Creek (6002)	180
Joes Bay (6460)	225
John Day Channel (6151)	167
John Day Dam (6159)	174
John Day Point (6151)	167
John Day River (6151)	167
Johns River (6195)	180
Johnson Point (6460)	226
Johnsons Lee (5115)	111
Jonathan Rock (5895)	149
Jones Island (6379)	197
Juanita Bay (6449)	213
Judge Rock (5116)	112
Judith Rock (5116)	112
Junipero Serra Peak (5302)	117
Ka Lae (South Cape) (4115)	236
Kaala (4110)	253
Kaalualu Bay (4115)	236
Kaapahu Bay (4116)	242
Kaawalii Gulch (4115)	233
Kaawaloa Cove (4123)	238
Kaena Point, Lanai (4120)	249
Kaena Point, Oahu (4110)	256
Kaeo (4117)	265
Kahakuloa (4124)	245
Kahakuloa Bay (4124)	245
Kahakuloa Head (4124)	245
Kahala Point (4100)	264
Kahaluu (4140)	238
Kahana Bay (4110)	258
Kahe Point (4110)	256
Kahokunui (4130)	249
Kahoolawe Island (4130)	247
Kahoolawe Southwest Point Light (4130)	247
Kahuku (4110)	257
Kahuku Point (4110)	257
Kahului (4124)	245
Kahului Harbor (4124)	245
Kaiaka Bay (4110)	257
Kaiaka Point (4110)	257
Kaiholena Butte (4115)	236
Kaiholena Ridge (4115)	236
Kailikii Shoal (4115)	237
Kailio Point (4116)	242
Kailiu Point (4100)	263
Kailua (4164)	239
Kailua Bay, Hawaii (4164)	238
Kailua Bay, Oahu (4110)	259
Kaimu (4115)	235
Kainaliu (4140)	238
Kainalu (4130)	250
Kaiwi Channel (4116)	252
Kaiwi Point (4140)	239
Kaka Point (4130)	247
Kala Point (6405)	208
Kalaeloa Harbor (4130)	250
Kalalau Valley (4100)	263
Kalaloch Rocks (6002)	182
Kalama (6153)	169
Kalama River (6153)	169
Kalanai Point (4110)	258
Kalanipuu (4111)	260
Kalapana (4115)	235
Kalaupapa (4120)	252
Kalawao (4130)	252
Kalepa Ridge (4100)	264
Kalepolepo (4104)	243
Kalihi Channel (4109)	254
Kalihiwai Bay (4118)	263
Kalohi Channel (4130)	249
Kalua o Lapa (4130)	243
Kaluaaha (4130)	250
Kaluna Cliff (5602)	143
Kamaiki Point (4130)	248
Kamakou (4116)	249
Kamalino (4117)	265
Kamalo (4121)	251
Kamalo Gulch (4120)	251
Kamalo Harbor (4121)	251
Kamilo Point (4115)	236
Kamohio Bay (4130)	247
Kanaha Rock (4130)	250
Kanaka Bay (6380)	193
Kanapou Bay (4130)	247
Kaneilio Point (4136)	256
Kanem Point (6403)	192
Kaneohe (4134)	258
Kaneohe Bay (4134)	258
Kanewaa Point (4115)	237
Kanounou Point (4130)	244
Kaohikaipu Island (4131)	259
Kaoma Point (4101)	240
Kapaa (4100)	264
Kapalaoa (4140)	239
Kau Desert (4115)	236
Kau District (4115)	235
Kauai Channel (4117)	259
Kauai Island (4100)	259
Kauhako Bay (4115)	237
Kauhola Point Light (4140)	233

Page
Kauiki Head (4113) 241
Kaula (4117) 266
Kaulainaiwi Island (4103) 234
Kaulakahi Channel (4117) 264
Kaumaikeohu Peak (4115) 236
Kaumakani (4114) 262
Kaumalapau Harbor (4122) 249
Kaumalapau Light (4122) 249
Kauna Point (4115) 237
Kaunakakai (4121) 251
Kaunakakai Harbor (4121) 251
Kaununui Point (4117) 266
Kaunuopou Point (4117) 265
Kaunuopou Rocks (4117) 265
Kaupo Gap (4116) 241, 242
Kaupo Landing (4116) 242
Kaupulehu (4140) 239
Kawaewae (4117) 265
Kawai Point (4111) 260
Kawaihae (4167) 239
Kawaihae Bay (4167) 239
Kawaihae Heiau (4167) 240
Kawaihoa Point (4117) 265
Kawaikini (4100) 259
Kawela (4120) 251
Kawela Gulch (4120) 251
Kawelikoa Point (4111) 260
Kawili Point (4140) 239
Keahole Point (4140) 239
Kealaikahiki Channel (4130) 248
Kealaikahiki Point (4130) 248
Kealakekua Bay (4123) 238
Kealia, Hawaii (4115) 238
Kealia, Kauai (4100) 264
Kealia Pond (4104) 243
Keanae Point (4116) 246
Keanae Valley (4116) 246
Keanapapa Point (4120) 249
Keaoi Island (4115) 236
Keauhou (4163) 238
Keauhou Bay (4163) 238
Keauhou Point (4115) 235
Keawaeli Bay (4140) 233
Keawakapu (4130) 243
Keawanui Bay (4117) 266
Keawekaheka Point (4123) 238
Keehi Lagoon (4132) 255
Keikiwaha Point (4140) 238
Kekaa Point (4130) 244
Kekaha (4100) 262
Kellers Shelter (5101) 101
Kellett Bluff (6379) 193
Kellett Ledge (6380) 200
Kelley Point (6155) 170
Kelp 86
Kelp Reefs (6380) 195
Kelso (6153) 169
Kennewick (6164) 175
Keomuku (4130) 249
Keoneoio (La Perouse) (4130) 243
Keopuka Rock (4116) 246
Kepuhi Point, Kauai (4118) 263, 264
Kepuhi Point, Oahu (4136) 256
Kerry (6152) 168
Ketron Island (6460) 226
Kettle River (6169) 175
Kewalo Basin (4132) 254
Keyport (6445) 219
Keyport Navy Torpedo Station (6445) 219
Keystone Harbor (6450) 208
Kiapot Point (6403) 192
Kibesillah Rock (5602) 142
Kihei (4104) 243

Page
Kihewamoku Islet (4110) 257
Kiholo (4140) 239
Kiholo Bay (4140) 239
Kii Landing (4117) 265
Kiikii Stream (4110) 257
Kikepa Point (4117) 265
Kiket Island (6376) 201
Kikiaola Boat Harbor (4114) 262
Kikoa Point (4130) 248
Kilauea (4115) 235
Kilauea (volcano) (4115) 232, 235
Kilauea (village) (4118) 263
Kilauea Bay (4118) 263
Kilauea Point (4118) 263
Kilauea Stream (4118) 263
Kilisut Harbor (6405) 208
Kimo Point (4115) 236
Kincheloe Point (6112) 161
King Peak (5602) 143
King Spit (6422) 218
Kingston (6445) 210
Kipahulu (4116) 242
Kipahulu Valley (4116) 242
Klamath (5702) 148
Klamath River (5702) 148
Klas Rock (6421) 209
Klooqueh Rock (5952) 153
Koalii (4130) 250
Kohala Mountains (4140) 233
Kohala Peninsula (4115) 232
Koitlah Point (6265) 189
Koko Crater (4131) 253
Koko Head (4131) 253
Kokole Point (4100) 262
Kolekole Gulch (4115) 234
Kolo Harbor (4121) 251
Koloa (4111) 261
Koloa Landing (4111) 261
Kolokolo Point (4118) 263
Kona Coast (4115) 237
Koolau Gap (4116) 241, 246
Koolau Range (4110) 252
Kuaehu Point (4100) 264
Kuakumoku Rock (4117) 265
Kualoa Point (4134) 258
Kuaokala Ridge (4110) 257
Kuheia Bay (4130) 248
Kuhio Bay (4103) 234
Kuhio Park (4111) 261
Kuhiwa Gulch (4116) 247
Kuia Shoal (4130) 248
Kukailimoku Point (4164) 239
Kukii Point (4111) 260
Kukio (4140) 239
Kukuihaele (4162) 233
Kukuihoolua Islet (4110) 258
Kukuiula (4111) 261
Kukuiula Bay (4111) 261
Kupapau Point (4115) 235
Kure Island (4177) 272
Kwomais Point (6300) 205

La Conner (6376) 202
La Cruz Rock (5302) 117
La Honda Canyon (5302) 114
La Perouse Bay (Keoneoio) (4130) 243
La Perouse Pinnacle (4171) 267
La Push (6102) 182
Laau Point (4120) 251
Lady Island (6156) 172
Laguna Beach (5101) 96
Laguna Point (5703) 142
Lahaina (4130) 244

	Page
Lahilahi Point (4136)	256
Laie (4110)	258
Laie Bay (4110)	258
Laie Point (4110)	258
Lake Celilo (6158)	174
Lake Crockett (6450)	208
Lake Earl (5702)	150
Lake River (6154)	169
Lake Talawa (5702)	150
Lake Union (690–SC)	213
Lake Wallula (6163, 6164)	175
Lake Washington (6449)	213
Lake Washington Ship Canal (690–SC)	213
Lakebay (6460)	225
Lamaloa Head (4130)	252
Lanai City (4116)	248
Lanai Island (4116)	248
Lanaihale (4116)	248
Lands End (5532)	124
Langley (6450)	215
Langley Point (6376)	200
Lanipuao Rock (4111)	261
Lansing Rock (5386)	115
Launiupoko Point (4130)	244
Laupahoehoe (4115)	234
Laupahoehoe Point (4115)	233
Lavigia Hill (5261)	103
Lawai Bay (4111)	261
Lawrence Point (6380)	200
Lawson Reef (6380)	199
Lawson Rock (6380)	199
Laysan Island (4186)	269
Leadbetter Point (6185)	177
Leahi Point (4117)	265
Leaning Rock (5896)	151
Legal holidays	278
Lehua Channel (4117)	265
Lehua Island (4117)	265
Lehua Rock Light (4117)	265
Lehuawehe Bay (4100)	264
Leleiwi Point (4115)	235
Leo Reef (6380)	199
Lepeamoa Rock (4115)	237
Lewis and Clark River (6151)	167
Lewis River (6154)	169
Liberty Bay (6445)	219
Licensing of vessels	6
Lido Isle (5108)	97
Lieser Point (6156)	172
Lifeboat stations	275
Light characteristics	1
Light Lists	3, 275
Lightships	4
Lihue (4100)	259
Lilliwaup (6460)	218
Lilliwaup Bay (6460)	218
Lime Kiln Light (6380)	193
Lime Point (5532)	125
Limestone Point (6379)	197
Lion Rock (5387)	115
Lion (Seal) Rock (5302)	114
Lipoa Point (4130)	244
Lisabeula (6460)	222
Lisianski Island (4186)	269
Little (Old) Cojo (5202)	104
Little Head (5846)	147
Little Island (6380)	196
Little River, South of Mendocino Bay (5711)	141
Little River, Trinidad Head (5602)	147
Little River Rock (5846)	147
Little Slate Rock (5302)	118
Little Sur River (5476)	118
Loa Point (4115)	238
Lobos Rocks (5476)	119
Local magnetic disturbance	3
Local Notices to Mariners	3
Local weather bulletins	9
Loma Prieta (5402)	121
Lone Black Rock (5387)	115
Lone Tree Point (5533)	131
Long Beach (5147, 5148)	97
Long Beach Breakwater (5148)	98
Long Beach Harbor (5147)	97
Long Beach Light (5147)	98
Long Island, San Juan Channel (6380)	195
Long Island, Willapa Bay (6185)	178
Long Island Shoal (6185)	178
Long Point near Point Vicente (5142)	100
Long Point, Santa Catalina Island (5112)	107
Long Rock (5895)	150
Longbranch (6460)	225
Longview (6153)	168
Longview Bridge (6153)	168
Lookout Rock (5951)	152
Lopez (6380)	196
Lopez Hill (6380)	195
Lopez Island (6380)	195
Lopez Pass (6380)	199
Lopez Point (5302)	117
Lopez Rock (5302)	117
Lopez Sound (6380)	199
Loran	5
Lord Island (6153)	168
Los Angeles (5147, 5148)	97
Los Angeles Harbor (5147)	97
Los Angeles Light (5147)	98
Los Coronados (5101)	93
Low Island (6379)	197
Low Point (6382)	190
Lowell Point (6450)	215
Lualailua Hills (4116)	243
Lualualei Homestead (4136)	256
Lulu Island (6300)	206
Lumahai River (4118)	263
Lummi Bay (6380)	204
Lummi Island (6380)	201
Lummi Island (village) (6378)	203
Lummi Peak (6380)	201
Lummi Point (6378)	203
Lummi Rocks (6380)	201
Lunada Bay (5144)	100
Lydia Shoal (6380)	200
Lyle Point (6460)	226
Lynch Cove (6460)	219
Lyons Ferry	175
Maalaea (4104)	243
Maalea Bay (4104)	243
Macaulay Point (6380)	189
Mack Arch (5896)	151
Mack Arch Cove (5896)	151
Mack Reef (5896)	151
Mackaye Harbor (6380)	196
Mad River (5602)	147
Madrona (6450)	215
Madrona Beach (6450)	215
Magnolia Bluff (6449)	211
Mahaiula (4140)	239
Mahie Point (4110)	258
Mahukona Harbor (4101)	240
Maili Point (4110)	256
Makaalae Point (4116)	242
Makahoa Point, Kauai (4118)	263
Makahoa Point, Oahu (4110)	257
Makahuena Point (4111)	261
Makalii Point (4110)	258

	Page
Makanalua Peninsula (4120)	252
Makanau Butte (4115)	236
Makaohule Point (4101)	240
Makaokahai Point (4111)	261
Makapili Rock (4118)	263
Makapuu Head (4131)	253
Makapuu Point Light (4131)	253
Makena Anchorage (4130)	243
Makolea Point (4140)	239
Mal Pass (5602)	140
Mala (4130)	244
Malaga Cove (5144)	101
Maliko Bay (4124)	246
Mamala Bay (4109, 4132)	254
Mamalu Bay (4116)	242
Mana (4100)	262
Mana Point (4100)	262
Manana Island (4131)	259
Manchester (6446)	221
Mandalay Beach (5202)	102
Mandeville Cut (5527)	134
Manele Bay (4130)	248
Manhattan Beach (5144)	101
Maniania Pali (4115)	236
Mano Point (4140)	239
Mansfield Break (5895)	149
Manzanita (6445)	219
Manzanita Bay (6445)	219
Mapleton (6023)	157
March Point (6376)	202
Mare Island (5525)	131
Mare Island Strait (5525)	131
Marina (5403)	120
Marina del Ray (5144)	101
Marine Exchange, San Francisco	128
Marine weather broadcasts	9
Mariners Basin (5107)	95
Markham (6195)	180
Maro Reef (4174)	269
Marrowstone Island (6405)	208
Marrowstone Point (6405)	207
Marshfield Channel (5984)	156
Martin Island (6153)	168
Martin Slough (6153)	169
Martinez (5574)	133
Maryhill (6158)	174
Marys Peak (5802)	158
Marysville	137
Matia Island (6380)	201
Mats Mats (6421)	209
Mattole Canyon (5795)	144
Mattole Point (5795)	144
Mattole River (5795)	144
Maui Island (4116)	241
Maulua Bay (4115)	234
Mauna Kea (4115)	232
Mauna Loa, Hawaii (4115)	232
Mauna Loa, Molokai (4116)	250
Maunalei Gulch (4130)	249
Maunalua Bay (4131)	253
Maury Island (6460)	221
Mayfield Slough (5531)	128
Maylor Point (6404)	216
Mayo Cove (6460)	225
McConnell Island (6379)	197
McDermott Point (6460)	225
McGregor Point (4130)	244
McKenzie Head (6151)	164
McLean Point (6055)	159
McNary Dam (6163)	174
McNeil Island (6460)	225
McNutt Gulch (5795)	144
Meadow Point (6445)	210
Meadowdale (6450)	214
Measured courses:	
Barbers Point, Hawaii (4133)	256
Eliza Island, Wash. (6378)	203
Near La Jolla, Calif. (5101)	96
Long Beach, Calif. (5148)	98
Newport Bay, Calif. (5108)	96
North Island, Calif. (5105)	94
Oakland, Calif. (5535)	129
Olympia, Wash. (6462)	227
Parry Bay, Wash. (6382)	188
Point Vicente, Calif. (5142)	100
San Clemente, Calif. (5118)	107
Santa Barbara, Calif. (5261)	103
Seattle, Wash. (6449)	213
Tacoma, Wash. (6407)	223
Treasure Island, Calif. (5535)	127
Vancouver (6156)	172
Vashon Island, Wash. (6460)	221
Megler (6151)	167
Mendocino (5711)	141
Mendocino Bay (5711)	141
Mendocino Canyon (5795)	144
Mercator projection	2
Merchant vessel aircraft assistance procedure	6
Miami Cove (6112)	161
Midchannel Bank (6405)	207
Middle Bank (6380)	193
Middle Channel (6380)	195
Middle Breakwater (5147)	98
Middle Farallon (5598)	123
Middle Harbor (5535)	129
Middle Loch (4110)	256
Middle Point (6403)	192
Middle River (5527)	135
Middle River (town) (5527)	135
Middle Rock, Hoh River (6102)	182
Middle Rock, San Miguel Island (5116)	112
Middle Waterway (6407)	223
Midway Islands (4185, 4188)	271
Midway Point (5702)	149
Mile Rocks (5532)	124
Mill Reach (6185)	178
Miller Bay (6445)	210
Miller Island (6158)	174
Millers Peak (4181)	266
Millicoma River (5984)	156
Millington (5984)	156
Milolii (4115)	237
Milwaukie (6171)	171
Milwaukee Waterway (6407)	223
Minesweeper signals	6
Minor Island (6380)	189
Miramontes Point (5520)	122
Misery Point (6450)	218
Mission Bay Park (5107)	95
Mission Beach, Possession Sound (6448)	215
Mission Beach, San Diego (5101)	95
Mitchell Bay (6379)	193
Moaula (4130)	247
Moclips (6002)	181
Moclips River (6002)	180
Mokae Cove (4116)	242
Mokapu Island (4130)	252
Mokapu Peninsula (4110)	258
Mokeehia Island (4124)	245
Mokelumme River (5527)	135
Mokio Point (4120)	252
Mokohola Island (4130)	252
Mokolea Point (4118)	263
Mokolea Rock, Molokai (4130)	252
Mokolea Rock, Oahu (4110)	259
Mokolii Island (4134)	258

	Page
Mokuaeae Island (4118)	263
Mokualai Islet (4110)	258
Mokuauia Island (4110)	258
Mokuhooniki (4130)	250
Mokulua Islands (4110)	259
Mokumana Rock (4116)	246
Mokumanu Islands (4110)	258
Mokuoloe Island (4134)	258
Molate Point (5532)	130
Moloaa Bay (4100)	264
Molokai Island (4116)	249
Molokai Light (4120)	252
Molokini (4130)	243
Molokini Island Light (4130)	243
Montara Mountain (5402)	122
Monterey (5403)	120
Monterey Bay (5403)	119
Monterey Canyon (5403)	119
Monterey Harbor (5403)	120
Monterey Wind Gap	120
Montesano (6195)	180
Moore Hill (5795)	144
Mooring Rock (5711)	141
Moresby Island (6380)	195
Morgan Rock (5602)	143
Mormon Temple (4110)	258
Morro Bay (5387)	115
Morro Bay (town) (5387)	115
Morro Rock (5387)	115
Morrow Cove (5534)	132
Mosquito Pass (6379)	193
Moss Landing (5403)	120
Moss Landing Harbor (5403)	120
Mouatt Reef (6380)	194
Mount Adams (6151)	164
Mount Buchon (5387)	115
Mount Carmel (5476)	119
Mount Coffin (6153)	168
Mount Constitution (6380)	197
Mount Dallas (6380)	193
Mount Hood (6151)	164
Mount Hualailai (4140)	232, 238
Mount Kohala (4115)	232
Mount Saint Helens (6151)	164
Mount Tamalpais (5532)	124
Mount Waialeale (4100)	259
Mouse Rock (5387)	116
Mud Bay (6460)	228
Mugu Canyon (5202)	102
Mukilteo (6448)	214
Mukkaw Bay (6265)	183
Multnomah Channel (6154)	169
Muolea Point (4116)	242
Murden Cove (6446)	210
Mussel Point (5702)	148
Mussel Rock, Crescent City (5895)	149
Mussel Rock, north of False Cape (5795)	145
Mussel Rock, St. George Reef (5895)	150
Mussel Rocks (5795)	144
Mutiny Bay (6450)	208
Mystery Bay (6405)	208
Na Puu a Pele (4115)	237
Naalehu (4115)	236
Nahcotta (6185)	178
Nahcotta Channel (6185)	178
Nahiku (4116)	247
Nahuna Point (4130)	243
Nakalele Point (4130)	245
Nanaimo (6300)	206
Nanakuli (4110)	256
Nanoose Harbor (6300)	206
Nanualele Point (4113)	241
Napa River (5533)	132
Napali (4100)	262
Napili Bay (4130)	244
Napoopoo (4123)	238
Naselle (6185)	178
Naselle River (6185)	178
National City (5107)	93
Nautical charts	2, 274
Naval Oceanographic Office	9
Naval Supply Center (5535)	129
Navarro Head (5703)	140
Navarro River (5703)	140
Navigation regulations	12, 58
Nawiliwili (4111)	260
Nawiliwili Bay (4111)	260
Nawiliwili Harbor Light (4111)	260
Neah Bay (6266)	189
Neah Bay (town) (6266)	190
Neahkahnie Mountain (5902)	162
Necanicum River (5902)	163
Neck Point (6379)	196
Necker Island (4181)	267
Ned Point (6382)	188
Neds Rock (6195)	179
Needle Rock, near Point Delgado (5602)	143
Needle Rock, Rogue River Reef (5951)	152
Needle Rock Point (5402)	121
Nehalem (6122)	162
Nehalem Beach (6122)	162
Nehalem River (6122)	162
Neill Point (6460)	222
Nemah River Channel (6185)	178
Nero Bank (4185)	272
Neskowin Rock (5902)	160
Nestucca Bay (5902)	160
Nestucca River (5902)	160
Netarts (5902)	161
Netarts Bay (5902)	161
Neva Shoal (4186)	270
New Westminster (6300)	206
New York Slough (5527)	133
Newberg (6172)	171
Newport, California (5108)	96
Newport, Oregon (6055)	159
Newport Bay (5108)	96
Newport Beach (5108)	96
Niihau Island (4117)	265
Nihoa (4181)	266
Ninini Point (4111)	260
Ninole (4115)	234
Ninole Gulch (4115)	236
Nisqually Head (6460)	226
Nisqually Reach (6460)	226
Nisqually River (6460)	226
Nob Island (6379)	197
Nohili Dune (4100)	262
Nohili Point (4100)	262
Nonopapa Landing (4117)	265
Nonou (4100)	264
Noonday Rock (5598)	123
Nordland (6405)	208
North Arm (6300)	206
North Bay, Grays Harbor (6195)	180
North Bay, San Juan Channel (6380)	196
North Bend (5984)	156
North Farallon (5598)	123
North Fork, Mokelumne River (5527)	135
North Fork, Skagit River (6450)	216
North Head (6151)	164
North Island, Pearl and Hermes Reef (4175)	270
North Island, San Diego Bay (5105)	94
North Pass (6379)	197
North Peapod Rock (6380)	200

	Page
North Portland Harbor (6155)	172
North River (6185)	178
North Rock, south of Hoh Head (6102)	182
North Rock, north of Rogue River (5951)	152
North Slough (5984)	156
Northampton Banks (4182)	269
Northport (6169)	175
Northwest Anchorage (5115)	111
Northwest Cape (4181)	267
Northwest Harbor (5118)	107
Northwest Island (6376)	200
Northwest Pass (6376)	199
Northwest Rock, Orford Reef (5952)	153
Northwest Rock, Rogue River Reef (5951)	152
Northwest Seal Rock (5895)	149
Norwegian Point (6450)	209
Nose Rock (5703)	140
Notices to Mariners	275
Noyo (5703)	141
Noyo Anchorage (5703)	141
Noyo River (5703)	141
Nuaailua Bay (4116)	246
Numbering and recording of undocumented vessels	6
Nuu Landing (4116)	242
Nuuanu Pali (4110)	253
Oahu Island (4110)	252
Oak Bay (6450)	208
Oak Harbor (6404)	216
Oak Harbor (town) (6404)	216
Oak Head (6450)	218
Oakland (5535)	129
Oakland Bay (6461)	228
Oakland Inner Harbor (5535)	129
Oakland Outer Harbor (5535)	129
Observatory Point (6382)	190
Obstruction Island (6380)	198
Obstruction Pass (6380)	198
Oceano (5302)	114
Oceanside (5101)	96
Off-Trinidad Rock (5846)	147
Ogden Point (6380)	189
Okala Island (4130)	252
Okoe (4115)	237
Okoe Bay (4115)	237
Olaa (4115)	235
Olalla (6460)	222
Old (Little) Cojo (5202)	104
Old River (5527)	135
Oleum (5533)	131
Olga (6380)	198
Olney (6151)	167
Olowalu (4130)	244
Olowalu Stream (4130)	244
Olympia (6462)	227
Olympia Shoal (6462)	227
Onamac Point (6450)	215
O'Neal Islet (6379)	197
Ookala (4115)	233
Oomano Point (4114)	262
Oopuola Cove (4116)	246
Opana Point (4116)	246
Open Bay (6379)	194
Opihikao (4115)	235
Opikoula Point (4116)	247
Orcas (6379)	198
Orcas Island (6380)	197
Orcas Knob (6380)	197
Orchard Point (6446)	219
Orchard Rocks (6446)	219
Oregon City (6171)	171
Orella (5202)	104
Orford Reef (5952)	153
Ork Reef (6004)	157
Oro Bay (6460)	226
Oretga Hill (5202)	103
Osborn Bank (5101)	109
Ostrander (6153)	169
Ostrich Bay (6446)	221
Otter Rock (6056)	159
Outer Islands (4000)	266
Outer Islet (5302)	116
Outer Pinnacle Rock (4113)	241
Outer Santa Barbara Passage (5111)	106
Overhead cables	3
Owen Point (6300)	188
Oyster Bay, Dyes Inlet (6446)	221
Oyster Bay, Totten Inlet (6460)	228
Ozette Island (6265)	183
Paa Cones (4111)	261
Paauhau (4161)	233
Paauilo (4115)	233
Pachena Point (6102)	184
Pacific Beach (5101)	95
Pacific City (5902)	160
Pacific Grove (5403)	120
Padilla Bay (6376)	202
Padre Junipero Serra's Cross (5007)	102
Pahala (4115)	236
Pahu Point (4130)	252
Paia (4124)	246
Pailolo Channel (4130)	247
Painted Cave (5115)	110
Paintersville (5528)	136
Pakua Butte (4115)	236
Palaoa Point Light (4130)	248
Palemano Point (4123)	238
Pali Kaholo (4130)	248
Pali o Mamalu (4115)	236
Palisades (5112)	107
Palix River (6185)	178
Palm Beach (5403)	120
Palo Alto Municipal Airport (5531)	129
Palos Verdes Point (5144)	100
Pancake Point (6152)	168
Pandora Hill (6380)	189
Paniau (4117)	265
Papaa Bay (4100)	264
Papaaloa (4115)	234
Papaikou (4115)	234
Papalaua Falls (4130)	252
Papawai Point (4130)	244
Paradise Cove (5101)	101
Parker Reef (6380)	198
Parkersville (6156)	172
Parks Bay (6379)	196
Parry Bay (6382)	188
Partridge Bank (6450)	192
Pasco (6164)	175
Pass Island (6376)	199
Patos Island (6380)	194
Paukaa Point Light (4103)	234
Paukauila Stream (4110)	257
Pauwalu Harbor (4130)	250
Pauwalu Point (4116)	246
Pauwela (4124)	246
Pauwela Point (4124)	246
Pauwela Point Light (4124)	245
Peace Monument (6300)	204
Peale Passage (6460)	227
Peapod Rocks (6380)	200
Pear Point (6380)	196
Pearl and Hermes Reef (4175)	270

	Page
Pearl Harbor (4110)	255
Pearl Island (6379)	194
Peavine Pass (6380)	198
Pebble Beach (5476)	119
Pecho Rock (5387)	115
Pedder Bay (6382)	188
Pelican Bay, north of Point St. George (5702)	150
Pelican Bay, Santa Cruz Island (5114)	110
Pender Islands (6380)	195
Penguin Bank (4120)	251
Peninsula Drainage Canal (6155)	170
Penn Cove (6450)	215
Pepeekeo Point (4115)	234
Perkins Reef (6102)	182
Pescadero Creek (5402)	122
Pescadero Point (5402)	122
Petaluma (5533)	131
Petaluma River (5533)	131
Pfeiffer Point (5476)	118
Phinney Bay (6446)	221
Pickering Passage (6460)	226
Pico Blanco (5476)	118, 119
Pico Rock (5302)	116
Piedras Blancas (5302)	116
Pigeon Point (5402)	122
Pilale Bay (4116)	246
Pillar Point, east of Slip Point (6300)	190
Pillar Point, north of Pigeon Point (5520)	122
Pillar Point Harbor (5520)	122
Pillar Rock (6112)	161
Pilot Rock (5846)	147
Pimoe (4116)	243
Pin Rock (5128)	108
Piner Point (6460)	222
Pinnacle Peak (4100)	264
Pinole Point (5533)	131
Pioneer Bank (4183)	270
Pismo Beach (5302)	114
Pistol River (5896)	152
Pitas Point (5202)	103
Pitcher Point (6112)	161
Pitt Island (6460)	225
Pitt Passage (6460)	225
Pittsburg (5576)	133
Plane of reference, charts	2
Plaskett Rock (5302)	117
Pleasant Harbor (6450)	218
Pogy Bank (4185)	272
Pohakueaea Point (4116)	242
Pohakuloa Point (4130)	249
Pohue Bay (4115)	237
Point Adams (6151)	164
Point Ano Nuevo (5402)	121
Point Arena (5502)	140
Point Arguello (5202)	105
Point Atkinson (6300)	206
Point Avisadero (5531)	128
Point Bennett (5116)	112
Point Bonita (5532)	124
Point Blunt (5532)	130
Point Brown (6195)	179
Point Buchon (5387)	115
Point Cabrillo (5711)	141
Point Carquinez (5574)	132
Point Castillo (5261)	103
Point Cavallo (5532)	130
Point Chehalis (6195)	179
Point Conception (5202)	104
Point Cypress (5476)	119
Point Dalco (6460)	222
Point Defiance (6407)	223
Point Delgada (5773)	143
Point Diablo (5532)	125
Point Disney (6380)	194
Point Doughty (6380)	197
Point Dume (5101)	101
Point Ellice (6151)	167
Point Estero (5387)	115
Point Evans (6460)	224
Point Fermin (5147)	98
Point Frances (6378)	203
Point George (6379)	196
Point Glover (6446)	219
Point Grenville (6002)	181
Point Grey (6300)	206
Point Hammond (6380)	194
Point Hannon (6421)	217
Point Herron (6440)	220
Point Heyer (6460)	221
Point Hudson (6405)	207
Point Hueneme (5007)	102
Point Jefferson (6445)	210
Point Joe (5403)	119
Point Knox (5532)	130
Point La Jolla (5101)	95
Point Lobos, Carmel Bay (5476)	119
Point Lobos, San Francisco (5532)	123
Point Loma (5105)	93
Point Migley (6380)	201
Point Monroe (6445)	210
Point Montara (5402)	122
Point Mugu (5007)	102
Point No Point (6450)	209
Point of the Arches (6265)	183
Point Partridge (6450)	192
Point Pedernales (5302)	114
Point Piedras Blancas (5302)	116
Point Pinos (5403)	119
Point Pully (6460)	221
Point Reyes (5599)	123
Point Richmond (5532)	130
Point Roberts (6300)	205
Point St. George (5895)	149
Point Sal (5302)	114
Point San Bruno (5531)	128
Point San Luis (5386)	114
Point San Mateo (Coyote Point) (5531)	128
Point San Pablo (5532)	130
Point San Pedro, North of Pillar Point (5402)	122
Point San Pedro, San Pablo Bay (5532)	131
Point San Quentin (5532)	131
Point Santa Cruz (5403)	121
Point Sierra Nevada (5302)	117
Point Southworth (6460)	222
Point Stuart (5532)	130
Point Sur (5476)	118
Point Tiburon (5532)	130
Point Vancouver (6156)	172
Point Vashon (6446)	221
Point Vicente (5142)	100
Point Wells (6445)	210
Point White (6446)	219
Point Whitehorn (6380)	204
Point Wilson (6450)	192
Pointer Island (6380)	200
Pokai Bay (4136)	256
Pole Pass (6379)	197
Polnell Point (6404)	216
Poo Point (4114)	262
Porlier Pass (6300)	206
Port Allen (4108)	261
Port Angeles (6303)	191
Port Chicago (5575)	133
Port Costa (5574)	132

Page
Port Discovery (6403) 192
Port Gamble (6421) 217
Port Gamble (town) (6421) 217
Port Gardner (6448) 214
Port Hueneme (5007) 102
Port-Industrial Waterway (6407) 223
Port Kelley (6164) 175
Port Ludlow (6421) 209
Port Ludlow (town) (6421) 209
Port Madison (6445) 210
Port of Anacortes (6376) 202
Port of Astoria (6151) 167
Port of Bellingham (6378) 203
Port of Edmonds (6445) 210
Port of Ilwaco (6151) 166
Port of Oakland (5535) 129
Port of Portland Commission 170
Port of Redwood City (5531) 128
Port of Sacramento (5528) 137
Port of San Diego (5107) 95
Port of San Francisco (5535) 127
Port of Seattle (6449) 212
Port of Walla Walla (6164) 175
Port Orchard (6445, 6446) 219
Port Orchard (town) (6440) 220
Port Orford (5952) 153
Port Orford (town) (5952) 153
Port Quendall (6449) 213
Port Renfrew (6300) 188
Port San Juan (6300) 188
Port San Luis (5386) 114
Port Stanley (6380) 199
Port Susan (6450) 215
Port Townsend (6405) 207
Port Townsend (town) (6405) 207
Port Townsend Canal (6405) 208
Port Washington Narrows (6446) 220
Portage (6460) 222
Portage Bay (690–SC) 213
Portage Head (6265) 183
Portage Inlet (6380) 189
Portland (6155) 170
Portugese Point (6151) 168
Possession Point (6450) 209
Possession Sound (6450) 214
Post Office Bar Range (6155) 170
Post Point (6378) 203
Potatopatch Shoal (5532) 124
Potlach (6460) 218
Poulsbo (6445) 219
Poverty Bay (6460) 222
Pratt Cliff (6002) 181
President Channel (6380) 197
President Point (6445) 210
Presidio (5535) 126
Presidio Monument (5403) 120
Preston Point (6448) 214
Prevost (6380) 194
Prevost Harbor (6380) 194
Price Island (6152) 168
Priest Rapids Dam 175
Prince Island, off Pyramid Point (5896) 150
Prince Island, San Miguel Island (5116) 112
Prisoner Rock (5846) 147
Prisoners Harbor (5114) 110
Prosper (5971) 154
Protection Island (6403) 192
Puako (4167) 239
Puako Bay (4167) 239
Public Health Service 9, 276
Publications 274
Pueo Point (4117) 265

Page
Puffin Island (6380) 201
Puget Island (6152) 168
Puget Sound (6401) 207
Puget Sound Naval Shipyard (6440) 220
Puhilele Point (4116) 242
Pukamoe Point (4118) 263
Pukaulua Point (4116) 247
Pukoo (4121) 250
Pukoo Harbor (4121) 250
Pulemoku Rock (4110) 258
Puna District (4115) 235
Punaluu (4162) 236
Punaluu Harbor (4162) 236
Punchbowl Hill (4132) 254
Punta Arena (5115) 110
Punta Gorda, near Santa Barbara (5202) 103
Punta Gorda, south of Cape Mendocino (5795) 144
Puolo Point (4108) 261
Purisima Point (5302) 114
Puu Anahulu (4140) 239
Puu Enuhe (4115) 236
Puu Honuaula (4115) 235
Puu Hoomaha (4115) 236
Puu Hou (4115) 237
Puu Kaipapau (4110) 258
Puu Kamalii (4167) 240
Puu Koae (Sugarloaf) (4124) 245
Puu Konahuanui (4110) 253
Puu Kuili (4140) 239
Puu Kukai (4116) 246
Puu Kukui (4116) 241
Puu Laina (4130) 244
Puu Mailiilii (4136) 256
Puu o Hulu (4110) 256
Puu o Kahaula (4116) 246
Puu o Kanaloa (4130) 243
Puu o Keokeo (4115) 237
Puu o Kohola (4116) 246
Puu Ohau (4140) 238
Puu Olai, north coast of Maui (4124) 245
Puu Olai, west coast of Maui (4130) 243
Puu Paheehee (4136) 256
Puu Papai (4120) 251
Puu Poa Point (4118) 263
Puu Ulaula, Hawaii Island (4115) 236
Puu Ulaula, Lanai Island (4130) 249
Puu Waawaa (4140) 239
Puuhonua Point (4123) 238
Puuiki (4116) 242
Puukoae Island (4130) 247
Puukole Point (4117) 265
Puunoa Point (4130) 244
Puupehe Rock (4130) 248
Puuwai (4117) 265
Puyallup Waterway (6407) 223
Pylades Channel (6300) 206
Pyramid Cove (5117) 106
Pyramid Head (5117) 106
Pyramid Point (5896) 150
Pyramid Rock, Blanco Reef (5952) 153
Pyramid Rock, Cape Meares (6112) 161
Pyramid Rock, Mokapu Peninsula (4110) 258

Quarantine 9, 276
Quarry Point (5532) 130
Quartermaster Harbor (6460) 222
Queets River (6002) 181
Quilcene (6450) 218
Quilcene Bay (6450) 218
Quillayute Needle (6102) 182
Quillayute River (6102) 182
Quinault River (6002) 181
Quivira Basin (5107) 95

	Page
Raccoon Shoal (5532)	131
Raccoon Strait (5532)	130
Race Rocks (6382)	188
Races Cove (6421)	217
Radio	9, 275
Radio bearing conversion table	294
Radio bearings	5
Radio bearings from other vessels	5
Radio navigational aids	1
Radiobeacons	5
Radiotelegraph broadcasts	10, 277
Radiotelephone broadcasts	10, 277
Raft Island (6460)	225
Raft River (6002)	181
Ragged Point (5302)	117
Rainier (6153)	169
Raita Bank (4182)	268
Randall Point (6448)	214
Ravenswood Point (5531)	128
Raymond (6185)	178
Reach Island (6460)	227
Red Bluff (5602)	140
Red Mountain (5702)	148
Red Rock (5532)	129
Redding Rock (5702)	148
Redfish Rocks (5952)	153
Redondo (6460)	222
Redondo Beach (5144)	101
Redondo Canyon (5144)	100
Redwood City (5531)	128
Redwood Creek (5531)	128
Reed Island (6156)	172
Reedsport (6004)	157
Reef Island (6379)	197
Reef Point (6380)	200
Reefs (4000)	266
Refugio Beach (5202)	104
Reid Harbor (6380)	194
Reid Rock (6379)	196
Requa (5702)	148
Reservation Bay (6376)	200
Reservation Point (5147)	99
Resort Point (5144)	100
Restoration Point (6446)	211
Restricted areas	8
Restwhile (6460)	218
Reynolds Rock (5602)	143
Ribbon Rock (5112)	107
Rich Passage (6446)	219
Richardson (6380)	196
Richardson Bay (5532)	130
Richardson Rock (5116)	112
Richland (6164)	175
Richmond Harbor (5532)	130
Ridgefield (6154)	169
Rincon Mountain (5202)	103
Rincon Point, San Francisco (5535)	127
Rincon Point, Santa Barbara (5202)	103
Rio Vista (5527)	136
Ripple Point (6380)	189
Roberts Bank (6300)	205
Robinson Landing (4114)	262
Robinson Point (6460)	222
Robinson Reef (5502)	139
Roche Harbor (6379)	194
Rock Creek (6157)	173
Rock Island (6171)	171
Rocky Bay, San Juan Channel (6379)	197
Rocky Bay, Vaughn Bay (6460)	227
Rocky Island (6171)	171
Rocky Peak (5951)	153
Rocky Point, Columbia River (6151)	168
Rocky Point, east of Duxbury Point (5532)	124
Rocky Point, south of Point Arguello (5202)	105
Rocky Point, Sarasota Passage (6450)	215
Rocky Point, north of Trinidad Head (5702)	148
Rocky Point, Washington Narrows (6446)	221
Rocky Prairie (5896)	151
Rodes Reef (5115)	111
Rodgers Break (5602)	143
Rodgers Peak (5702)	148
Rogue River (5951)	152
Rogue River Reef (5991)	152
Roosevelt (6160)	174
Rosario Head (6376)	200
Rosario Point (6380)	198
Rosario Strait (6380)	199
Rosedale (6460)	225
Rosenfeld Rock (6380)	195
Roseville (5105)	93
Ross Mountain (5502)	138
Round Rock (5895)	149
Rounded Islet (6102)	182
Routes	91, 231
Royal Roads (6382)	188
Russian Gulch (5711)	141
Russian River (5502)	138
Ruthton (6157)	173
Sacramento (5528)	136
Sacramento River (5527, 5528)	135
Sacramento Ship Channel (5527, 5528)	136
Saddle Hill (6002)	179
Saddle Mountain (5902)	163
Saddle Peak (5387)	115
Sail River (6300)	190
Sail Rock, Neah Bay (6300)	190
Sail Rock, near Point Arena (5502)	139
St. George Channel (5895)	149
St. George Reef (5895)	149
Saint Helens (6153)	169
St. Paul Waterway (6407)	223
St. Rogatien Bank (4182)	268
Salamanca Point (6300)	206
Salem (6172)	171
Sales agents	1, 273
Salinas Valley (5403)	119
Salinities table	285
Salmon Bay (690–SC)	213
Salmon Bank, near Pearl and Hermes Reef (4183)	271
Salmon Bank, San Juan Channel (6380)	195
Salmon Cone (5302)	117
Salmon Point (5711)	140
Salmon River (5902)	160
Salt Point (5502)	139
Samish Bay (6378)	203
Samish Island (6378)	202
Samoa (5832)	146
Samuel Island (6380)	206
San Clemente (5101)	96
San Clemente Island (5111)	106
San de Fuca (6450)	216
San Diego (5105, 5107)	93
San Diego Bay (5107)	93
San Francisco (5535)	126
San Francisco Bar (5532)	124
San Francisco Bay (5502)	123
San Francisco Lightship (5532)	124
San Francisco-Oakland Bridge (5535)	127
San Francisco Port Authority (5535)	127
San Joaquin River (5527)	133
San Juan Archipelago (6380)	193
San Juan Capistrano (5101)	96
San Juan Capistrano Valley (5101)	96
San Juan Channel (6380)	195
San Juan Creek (5101)	96

Page
San Juan Island (6380) 193
San Juan Point (6300) 188
San Juan Rock (5101) 96
San Leandro Bay (5535) 129
San Luis Hill (5386) 114
San Luis Obispo Bay (5386) 114
San Luis Obispo Creek (5386) 114
San Martin Rocks (5302) 117
San Mateo (5531) 128
San Mateo Creek (5101) 96
San Mateo Bridge (5531) 128
San Mateo Point (5101) 96
San Miguel Island (5116) 111
San Miguel Passage (5116) 111
San Nicolas Island (5113) 108
San Onofre Mountain (5101) 96
San Pablo Bay (5533) 131
San Pedro (5147) 97
San Pedro Bay (5148) 97
San Pedro Breakwater (5147) 98
San Pedro Channel (5101) 108
San Pedro Hill, Los Angeles (5142) 98
San Pedro Hill, San Pablo Bay (5532) 131
San Pedro Point (5114) 110
San Rafael (5532) 131
San Rafael Bay (5532) 131
San Rafael Creek (5532) 131
San Simeon (5302) 116
San Simeon Bay (5302) 116
San Simeon Point (5302) 116
Sand Hill Bluff (5402) 121
Sand Island, Columbia River (6151) 166
Sand Island, Honolulu (4109) 254
Sand Island, Kure Island (4177) 272
Sand Island, Midway Islands (4188) 271
Sand Island, Pearl and Hermes Reef (4175) 270
Sand Lake (5902) 160
Sand Point, near Rincon Point (5202) 103
Sand Point, Seattle (6449) 213
Sandy Island (6153) 168, 169
Sandy Point, Cowlitz Bay (6380) 194
Sandy Point, Santa Rosa Island (5116) 111
Sandy Point, Saratoga Passage (6448) 215
Sandy River (6156) 172
Sandy River Bar (6156) 172
Sanpoil River (6168) 175
Santa Ana (5142) 97
Santa Ana (wind) 89
Santa Ana River (5142) 97
Santa Barbara (5261) 103
Santa Barbara Channel (5202) 112
Santa Barbara Island (5110) 109
Santa Barbara Islands (5020) 106
Santa Barbara Point (5261) 103
Santa Catalina Island (5112) 107
Santa Cruz (5403) 121
Santa Cruz Channel (5115) 110
Santa Cruz Harbor (5403) 121
Santa Cruz Island (5114, 5115) 110
Santa Margarita River (5101) 96
Santa Monica (5144) 101
Santa Monica Bay (5144) 100
Santa Rosa Island (5115, 5116) 110
Santa Rosa Reef (5387) 115
Santa Ynez Mountains (5202) 103
Santiago Peak (5101) 96
Saratoga Passage (6450) 215
Sares Head (6376) 200
Satellite Island (6380) 194
Saturna Island (6380) 195
Saunders Reef (5502) 139
Sausalito (5532) 130
Sauvie Island (6154) 169

Page
Scales of nautical charts 1
Scarboro Hill (6151) 166
Scatchet Head (6450) 209
Scholfield Creek (6004) 157
Scorpion Anchorage (5114) 110
Scott Creek (5402) 121
Scottsburg (6004) 157
Scripps Institution of Oceanography (5101) 95
Scroggs Rocks (6382) 189
Sea Lion Rock, near Cape Vizcaino (5602) 142
Sea Lion Rock, near Punta Gorda (5795) 144
Seabeck (6450) 218
Seabeck Bay (6450) 218
Seabird Rocks (6102) 184
Seabright (5403) 121
Seacliff Beach (5403) 121
Seal Beach (5148) 97
Seal Bluff Landing (5575) 133
Seal Cove (5111) 106
Seal Rock (6300) 190
Seal (Lion) Rock (5302) 114
Seal Rocks, San Francisco (5532) 123
Seal Rocks, Skagit Bay (6376) 201
Seal Rocks, near Yaquina Bay (6056) 158
Sealion Rock (6002) 181
Search and rescue operations 6
Searchlights, improper use of prohibited 6
Sears Rock (5532) 125
Seaside, Monterey (5403) 120
Seaside, near Tillamook Head (5902) 163
Seattle (6449) 211
Seiche 11
Seismic sea wave warning displays 254
Seismic sea waves 11, 87, 230
Sekiu (6300) 190
Sekiu River (6300) 190
Selby (5533) 131
Selkirk Water (6380) 189
Semiahmoo (6399) 205
Semiahmoo Bay (6399) 205
Semiahmoo Spit (6399) 205
Semple Point (5534) 132
Sentinel Island (6379) 194
Sentinel Rock (6379) 194
Sequalitchew Creek (6460) 226
Sequim Bay (6403) 192
Sequim Bay State Park (6403) 192
Settler Point (6151) 167
Seven Devils (5802) 154
Shanks Landing (6171) 171
Shannon Point (6376) 202
Shark Bay (4181) 267
Shark Island (4171) 267
Shark Reef (6380) 196
Sharp Point (5702) 148
Shaw Island (6379) 198
Sheep Island (6379) 198
Shell Beach (5302) 114
Shelter Cove, Point Delgado (5773) 143
Shelter Cove, San Francisco Bay (5502) 123
Shelter Island (5105) 95
Shelton (6461) 228
Sheridan (6446) 221
Sheringham Point (6382) 188
Sherman Island (5527) 135
Sherwood Creek (6460) 227
Shilshole Bay (6449) 211
Shine (6421) 217
Ship Harbor (6376) 202
Ship Rock (5128) 108
Ships in distress 7
Shoal Point (6380) 189
Shoalwater Bay (6185) 178

691 - 231 O - 63 - 21

	Page
Shubrick Rock (5602)	143
Sidney Island (6380)	195
Sierra Point (5531)	128
Signal Hill (5148)	98
Silcott	175
Siletz Bay (5902)	160
Siltcoos River (5802)	157
Silverdale (6446)	221
Similk Bay (6376)	201
Simonton Cove (5116)	112
Sinclair Inlet (6440)	220
Sinclair Island (6380)	201
Sinkers	166
Sister Rocks (5702)	149
Sisters (6421)	217
Sisters Rocks (5951)	152
Sitcum Waterway (6407)	223
Siuslaw River (6023)	157
Sixes River (5952)	154
Sixtymile Bank (5020)	106
Skagit Bay (6376, 6450)	201, 216
Skagit Island (6376)	201
Skiff Point (6446)	210
Skipanon River (6151)	166
Skipjack Island (6380)	194
Skokomish River (6460)	218
Skookum Inlet (6460)	228
Skunk Point (5115)	111
Slate Rock (5302)	118
Slip Point (6300)	190
Small craft in distress	7
Small craft warnings	297
Small White Rock (5602)	143
Smith Island, Rosario Strait (6380)	189
Smith Island, San Luis Obispo Bay (5386)	115
Smith Point (6151)	166
Smith River, near Point St. George (5702)	150
Smith River, Umpqua River (6004)	157
Smuggler Cove, Cape Falcon (5902)	162
Smuggler Cove, Kahoolawe (4130)	248
Smugglers Cove, Santa Cruz Id. (5114)	110
Snake River (6164)	175
Snake Rock (6421)	209
Snatelum Point (6450)	215
Snohomish River (6448)	215
Soberanes Point (5476)	119
Soldiers Harbor (5703)	142
Soledad Mountain (5101)	95
Sonora Reef (6002)	181
Soquel Cove (5403)	120
Soquel Creek (5403)	121
Soquel Point (5403)	121
South Bay, Grays Harbor (6195)	180
South Bay, Humboldt Bay (5832)	146
South Bay, Nisqually Reach (6460)	226
South Bay, San Francisco (5532)	125
South Bend (6185)	178
South Cape (Ka Lae) (4115)	236
South Channel (6151)	167
South Cove (5802)	154
South Fork, Coos River (5984)	156
South Fork, Mokelumne River (5527)	135
South Fork, Skagit River (6450)	216
South Pass (6450)	215
South Pender Island (6380)	195
South Point (5115, 5116)	111
South Reef (6056)	158
South Rock (6102)	182
South Slough (5984)	156
South Vallejo (5525)	132
Southampton Shoal Light (5532)	129
Southeast Anchorage (5115)	111
Southeast Black Rock (5952)	153
Southeast Farallon (5598)	123
Southeast Island (4175)	270
Southeast Loch (4110)	256
Southeast Reef (5520)	122
Southwest Channel (4171)	268
Southwest Seal Rock (5895)	149
Souza Rock (5386)	115
Sow and Pigs (6112)	161
Spanish Bank (6300)	206
Spanish Canyon (5602)	143
Spartan Reef (4124)	245
Special signals for surveying vessels	1
Spieden Bluff (6379)	194
Spieden Channel (6379)	194
Spieden Island (6379)	194
Spike Rock (6265)	183
Split Rock, Cape Elizabeth (6002)	181
Split Rock, near Trinidad Head (5702)	148
Spokane River (6168)	175
Spouting Horn (4111)	261
Spring Passage (6379)	197
Squalicum Creek Waterway (6378)	203
Squamish Harbor (6421)	217
Square Black Rock (5302)	118
Squaxin Island (6460)	228
Squaxin Passage (6460)	228
Standard time	92
Stanley Channel (6185)	178
Stanley Peninsula (6185)	178
Stanley Rock (6157)	173
Stanwood (6450)	215
Star Rock (5895)	149
Starr Rock (6378)	203
Steamboat Island (6460)	228
Steamboat Rock (5795)	144
Steamboat Slough, Columbia River (6152)	168
Steamboat Slough, Snohomish River (6448)	215
Stearns Wharf (5261)	103
Steep Point (6379)	196
Steilacoom (6460)	226
Stella (6153)	168
Stevenson (6157)	173
Steveston (6300)	206
Stewarts Point (5502)	139
Still Harbor (6460)	225
Stillwater Cove (5476)	119
Stillwell Point (5711)	141
Stockton (5527)	134
Stone Lagoon (5702)	148
Stonewall Bank (6056)	158
Storm warning stations	277
Storm waves	11
Strait of Georgia (6300)	204
Strait of Juan de Fuca (6300)	187
Strawberry Bay, Rosario Strait (6380)	200
Strawberry Bay, Teahwhit Head (6102)	182
Strawberry Island, Deception Pass (6376)	199
Strawberry Island, Rosario Strait (6380)	200
Strawberry Point (6450)	216
Stretch Island (6460)	226
Strip, The (5984)	156
Striped Peak (6382)	191
Stuart Island (6380)	194
Sturgeon Bank (6300)	205
Submarine cable areas	3
Submarine emergency identification signals	7
Sucia Islands (6380)	195
Sugar Loaf (5795)	144
Sugarloaf (Puu Koae) (4124)	245
Suisun Bay (5534)	133
Suisun City (5534)	133
Suisun Point (5574)	133
Suisun Slough (5534)	133

Page

Sulphur Springs Landing (6004) 157
Summerland (5202) 103
Summit Hill (4181) 267
Sunken Reef (5502) 138
Sunset Beach (5142) 97
Sur Rock (5476) 118
Surf (5302) 114
Surge 11
Sutil Island (5110) 109
Svensen (6151) 167
Swanson Channel (6380) 195
Swifts Bay (6380) 199
Swiftsure Bank (6102) 184
Swinomish Channel (6376) 201
Switzer Rock (5602) 142
Sycamore Canyon (5476) 118
Sylopash Point (6450) 218
Sylvan (6460) 224

Table Bluff (5832) 145
Table Mountain, near Alsea Bay (5802) 158
Table Mountain, Mexico (5020) 93
Tacoma (6407) 223
Taft (5902) 160
Tahkenitch Creek (5802) 157
Tahlequah (6460) 222
Taholah (6002) 181
Tala Point (6421) 209
Talcott Shoal (5116) 111
Tanager Peak (4181) 266
Tanner Bank (5101) 106
Tantalus (4110) 253
Tantalus Light (4132) 254
Totoosh Island (6265) 184
Teahwhit Head (6102) 182
Ten Mile River (5602) 142
Ten Mile River Beach (5602) 140
Tenmile Creek, north of Heceta Head (5802) 158
Tenmile Creek, south of Umpqua River (5802) 156
Terminal Island (5147) 97
Termination Point (6421) 217
Tern Island (4171) 267
Thatcher Pass (6380) 199
Thorndike Bay (6422) 217
Thrasher Rock (6300) 206
Three Arch Rocks (6112) 161
Three Tree Point (6152) 168
Three-tree Point (6460) 221
Threemile Creek (5802) 157
Threemile Slough (5527) 135
Tichenor Rock (5952) 153
Tidal Canal (5535) 129
Tidal Current Charts 3, 273, 275
Tidal Current Tables 3, 273, 275
Tide Point (6380) 200
Tide Rock (5302) 117
Tide Tables 3, 273, 275
Tides (see also name of place) 86
Tillamook (6112) 162
Tillamook Bay (6112) 161
Tillamook Head (5902) 163
Tillamook Rock (5902) 163
Time signals 10
Titlow Beach (6460) 224
Toandos Peninsula (6450) 218
Toke Point (6185) 178
Tokeland (6185) 178
Toleak Point (6102) 182
Toledo, Cowlitz River (6153) 169
Toledo, Yaquina River (6055) 159
Toliva Shoal (6460) 225
Tolo (6446) 219

Page

Tolo Bank (5602) 143
Tomahawk Island (6155) 172
Tomales Bay (5603) 138
Tomales Point (5603) 138
Tongue Point, Columbia River (6151) 167
Tongue Point, Crescent Bay (6382) 190
Totten Inlet (6460) 228
Towhead Island (6380) 200
Tracyton (6446) 221
Tranquillon Mountain (5202) 104
Treasure Island, Case Inlet (6460) 227
Treasure Island, San Francisco Bay (5535) 126
Trial Islands (6380) 189
Trincomali Channel (6300) 206
Trinidad (5846) 147
Trinidad Harbor (5846) 147
Trinidad Head (5846) 147
Triton Cove (6450) 218
Triton Head (6450) 218
Tropical storms 90
Troutdale (6156) 172
Tskutsko Point (6450) 218
Tsusiat Lake (6102) 184
Tualatin River (6171) 171
Tulalip (6448) 215
Tulalip Bay (6448) 215
Tule (5527) 133
Tunnel Island (6002) 181
Tunnel Point (6156) 172
Turn Island (6379) 196
Turn Point (6380) 194
Turn Rock (6379) 196
Turtle Back Range (6380) 197
Turtle Rocks (5702) 148
Twin Lakes (5403) 121
Twin Peak (5302) 117
Twin Rivers (6382) 190
Twin Rocks, Maui (4113) 241
Twin Rocks, San Juan Channel (6380) 196
Twin Rocks, north of Tillamook Bay (5902) 162
Twin Spits (6421) 217
Twins, The (6421) 209
Two Arches (5902) 160
Tyee Shoal (6446) 210
Tyler Bight (5116) 112

Uaoa Bay (4116) 246
Ule Point (4130) 247
Ulupau Crater (4110) 258
Umatilla (6162) 174
Umatilla Reef (6265) 183
Umilehi Point (4130) 252
Umpqua River (6004) 156
Underwood (6157) 173
Undocumented vessels 6
Union (6460) 218
Union Bay (690–SC) 213
University of Washington (6379), 690–SC) 196, 213
Upolu Point (4140) 233
Upright Channel (6379) 198
Upright Head (6380) 199
Urban Landing (6380) 201
Usal Rock (5602) 142
Usal Valley (5602) 142
Useless Bay (6450) 209
Utsalady (6450) 216

Valdes Islands (6300) 206
Vallejo (5525) 132
Vancouver, Columbia River (6155) 172
Vancouver Harbor (6300) 206
Vancouver Lake (6154) 169
Vashon (6460) 221

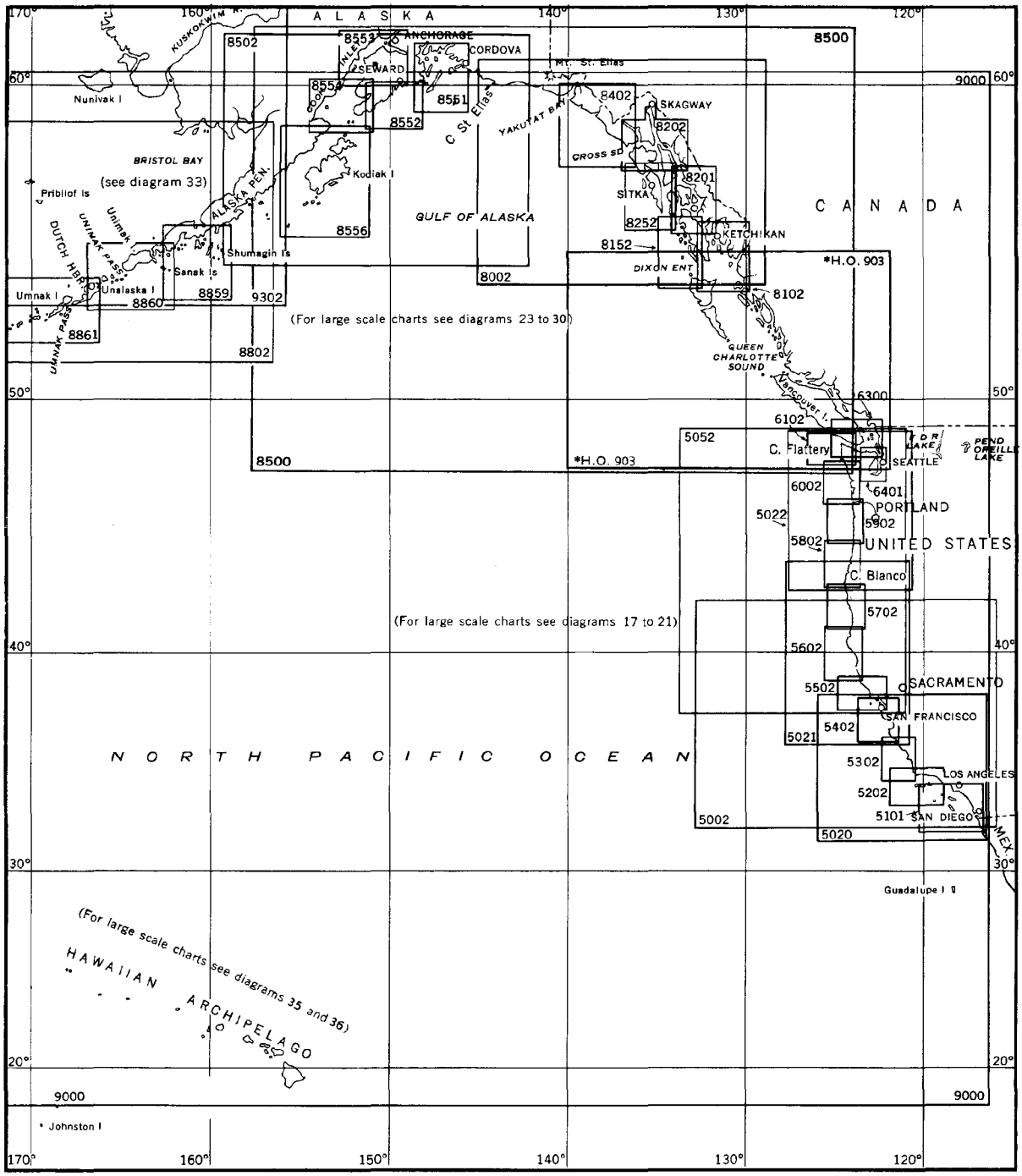
	Page
Vashon Heights Landing (6446)	221
Vashon Island (6460, 6446)	221
Vaughn (6460)	227
Vaughn Bay (6460)	227
Vega (6460)	226
Vendovi Island (6378)	203
Venice Cut (5527)	134
Ventura (5007)	102
Ventura County Harbor (5007)	102
Ventura River (5007)	102
Ventura Rocks (5476)	118
Verona	137
Victoria Harbor (6380)	189
Vigias (4000)	266
Villa Creek (5302)	117
Village Point (6380)	201
Visibility of objects table	295
Viti Rocks (6378)	203
Von Geldern Cove (6460)	225
Von Helm Rock (5302)	116
Waada Island (6266)	189
Waatch Point (6265)	184
Waatch River (6265)	184
Waddell Creek (5402)	121
Wahiawa Bay (4108)	261
Waiahukini (4115)	237
Waialee (4110)	257
Waialua, Molokai (4130)	250
Waialua, Oahu (4110)	257
Waialua Bay (4110)	257
Waianae (4136)	256
Waianae Mountains (4110)	253
Waieli (4120)	251
Waihee Point (4124)	245
Waihee Reef (4124)	245
Waihee Valley (4124)	245
Waikahalulu Bay (4130)	247
Waikapuna Bay (4115)	236
Waikiki Beach (4132)	254
Wailea (4115)	234
Wailea Point (4131)	259
Wailoa River (4103)	234
Wailua, Kauai (4100)	264
Wailua, Maui (4116)	247
Wailua Cove (4116)	242
Wailua River (4100)	264
Wailuku (4124)	245
Wailuku River (4103)	234
Wailupe (4131)	254
Waima Point (4167)	239
Waimanalo (4131)	259
Waimanalo Bay (4131)	259
Waimanu Valley (4115)	233
Waimea (4114)	262
Waimea River (4114)	262
Waimea Bay, Kauai (4114)	262
Waimea Bay, Oahu (4110)	257
Waimea River (4110)	257
Wainiha Bay (4118)	263
Wainiha River (4118)	263
Waioli Stream (4118)	263
Waipa Stream (4118)	263
Waipio (4115)	233
Waipio Bay (4116)	246
Waipio Gulch (4115)	233
Waipouli (4100)	264
Waldport (6056)	158
Waldron (6380)	194
Waldron Island (6380)	194
Walker	175
Walker Island (6153)	168
Walla Walla River (6164)	175
Wallace Island (6152)	168
Wallace Slough (6152)	168
Walnut Eddy (6172)	171
Walnut Grove (5528)	136
Wananapaoa Islet (4110)	257
Warrendale (6156)	173
Warrenton (6151)	166
Warrior Rock Light 2 (6154)	169
Washougal (6156)	172
Wasp Islands (6379)	196
Wasp Passage (6379)	197
Water temperatures table	285
Waterman Point (6446)	219
Watmough Bay (6380)	199
Wauna (6460)	225
Weather, (see also name of place)	88
Weather broadcasts	277
Weather Bureau	8, 277
Wedderburn (5951)	152
Weli Point (4108)	261
Welles Harbor (4188)	271
West Bank (6380)	195
West Basin (5147)	99
West Cove, Necker Island (4181)	267
West Cove, San Clemente Island (5118)	107
West End (5112)	107
West Linn (6171)	171
West Loch (4110)	256
West Pass (6450)	215
West Point, Elliott Bay (6449)	211
West Point, Santa Cruz Island (5115)	110
West Point, Whidbey Island (6376)	199
West Sound (6379)	198
West Waterway (6449)	212
Westcott Bay (6379)	193
Westcott Shoal (5116)	112
Westdahl Rock (5386)	115
Westhaven Cove (Westport Harbor) (6195)	179
Westpoint Slough (5531)	128
Westport, Columbia River (6152)	168
Westport, Grays Harbor (6195)	180
Westport Harbor (Westhaven Cove) (6195)	179
Westport Slough (6152)	168
Whale Rock (5895)	149
Whale Rocks (6380)	195
Whaleboat Rock (5302)	117
Whalehead Island (5896)	151
Whaler Island, Crescent City (5895)	149
Whaler Island, San Luis Obispo Bay (5386)	115
Whalers Cove	119
Whalers Knoll (5476)	119
Whalers Rock (5476)	119
Whatcom Creek Waterway (6378)	203
Wheeler (6122)	162
Whidbey Island (6380)	189
White Cliff (6380)	199
White Cove (5112)	107
White Rock, near Cape Alva (6102)	183
White Rock, near Klamath River (5702)	148
White Rock, north of Pt. Piedras Blancas (5302)	117
White Rock, south of Pt. Piedras Blancas (5302)	116
White Rock, Pointer Island (6380)	197
White Rock, near Trinidad Head (5702)	148
White Salmon River (6157)	173
Whites Point (5142)	100
Whitesboro Cove (5711)	140
Whiting Rock (5532)	130
Willamette (6171)	171
Willamette Falls Canal (6171)	171
Willamette River (6155)	169
Willapa Bay (6185)	177
Willapa Bar (6185)	177
Willapa River (6185)	177

	Page
William Point (6378)	202
Williamson Rocks (6376)	200
Willow Creek (5302)	117
Willows Anchorage (5115)	110
Wilmington (5147)	97
Willoughby Rock (6002)	181
Wilson Cove (5118)	107
Wilson Creek (5702)	148
Wilson Rock, north of Klamath River (5702)	149
Wilson Rock, San Miguel Island (5116)	112
Wilsonville (6172)	171
Winchester Bay (6004)	157
Wind River (6157)	173
Winds	1, 88
Windward Oahu (4110)	257
Windy Bluff (6460)	227
Windy Lane	113
Wing Point (6446)	210
Winslow (6446)	211
Wire drags	2
Wishkah River (6195)	180
Wollochet Bay (6460)	225
Woodland (6153)	169
Woods Lagoon (5403)	121
Wreck Creek (6002)	181
Wyckoff Ledge (5116)	112
Wyckoff Shoal (6460)	225
Yachats River (5802)	158
Yakima River (6164)	175
Yamhill River (6172)	171
Yankee Point (5476)	119
Yankee Point Rock (5476)	119
Yaquina (6055)	159
Yaquina Bay (6055)	158
Yaquina Head (6056)	158
Yaquina Reef (6056)	158
Yaquina River (6055)	158
Yellow Bluff (5532)	130
Yellow Island (6379)	197
Yellow Rock (5896)	151
Yeomalt Point (6446)	210
Yerba Buena Island (5535)	126
Yokeko Point (6376)	200
Youngs Bay (6151)	166
Youngs River (6151)	166
Yukon Harbor (6446)	221
Zuniga Point (5105)	94
Zuniga Shoal (5105)	94

Diagram No. 16

SAILING AND GENERAL CHARTS - PACIFIC COAST

October 1961

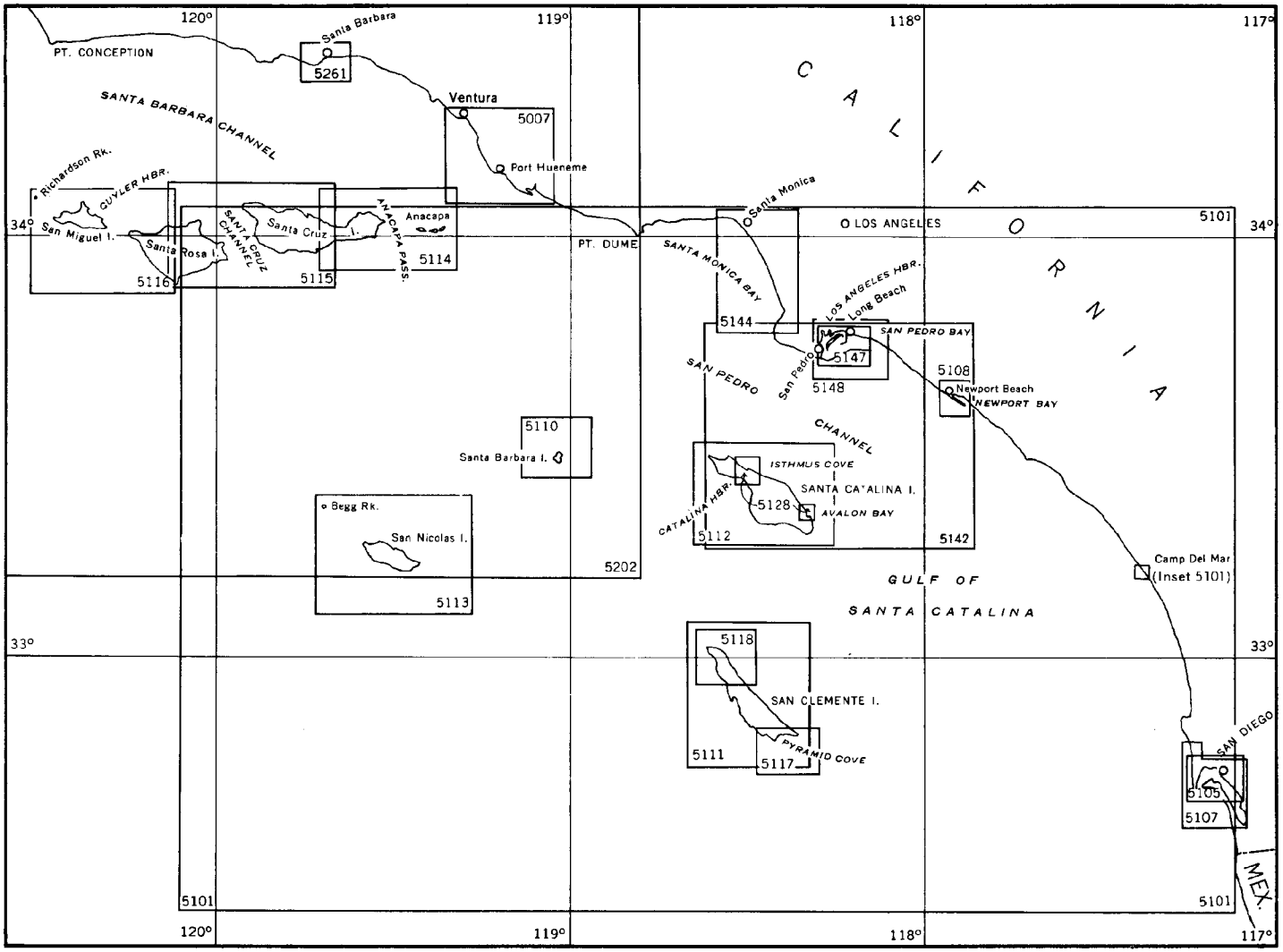


SAILING AND GENERAL CHARTS—PACIFIC COAST

No.	Price	TITLE	State	Scale	Paper size (inches)
		SAILING CHARTS			
5002	$1.00	San Diego to Point St. George		1:1,412,349	34X43
†5020	1.00	San Diego to San Francisco Bay		1:868,003	36X44
†5021	1.00	Monterey Bay to Coos Bay		1:811,980	33X45
†5022	1.00	Cape Blanco to Cape Flattery		1:736,560	33X42
5052	1.00	San Francisco to Cape Flattery		1:1,200,000	35X43
†8002	.75	Dixon Entrance to Cape St. Elias		1:969,756	33X42
†8500	1.00	Gulf of Alaska—Strait of Juan de Fuca to Kodiak Island		1:2,100,000	33X44
†8502	1.00	Cape St. Elias to Shumagin Islands		1:969,761	35X44
†8802	1.00	Alaska Peninsula and Aleutian Islands to Seguam Pass		1:1,023,188	36X43
†9000	1.00	San Diego to Aleutian Islands and Hawaiian Archipelago		1:4,860,700	36X44
†9302	.75	Bering Sea—eastern part		1:1,534,076	31X40
		GENERAL CHARTS			
5101	1.00	San Diego to Santa Rosa Island	California	1:234,270	35X50
5202	1.00	Point Dume to Purisima Point	"	1:232,188	33X48
5302	1.00	Point Conception to Point Sur	"	1:216,116	33X46
†5402	1.00	Point Sur to San Francisco	"	1;210,668	33X42
†5502	1.00	San Francisco to Point Arena	"	1:207,840	34X42
†5602	1.00	Point Arena to Trinidad Head	"	1:200,000	33X48
†5702	1.00	Trinidad Head to Cape Blanco	Calif. & Oregon	1:196,948	33X43
†5802	1.00	Cape Blanco to Yaquina Head	Oregon	1:191,730	33X48
†5902	1.00	Yaquina Head to Columbia River	Oreg. & Wash.	1:185,238	33X44
†6002	1.00	Columbia River to Destruction Island	"	1:180,789	33X41
†6102	1.00	Approaches to Strait of Juan de Fuca—Destruction Island to Amphitrite Point	Wash. & B.C.	1:176,253	35X44
6300	1.00	Strait of Georgia and Strait of Juan de Fuca	"	1:200,000	31X44
6401	.75	Admiralty Inlet and Puget Sound	Washington	1:150,000	32X41
8102	1.00	Hecate Str. to Etolin I., including Behm & Portland Canals	Alaska	1:229,376	34X43
8152	1.00	Dixon Entrance to Chatham Strait	"	1:229,376	33X45
8201	1.00	Etolin Island to Midway Islands, including Sumner Strait	"	1:217,828	34X45
8202	1.00	Midway Islands to Cape Spencer, including Lynn Canal	"	1:209,978	34X45
8252	1.00	Coronation Island to Lisianski Strait	"	1:217,828	35X45
8402	.75	Cross Sound to Yakutat Bay	"	1:300,000	33X42
8551	1.00	Prince William Sound	"	1:200,000	36X46
8552	.75	Point Elrington to East Chugach Island	"	1:200,000	31X39
8553	1.00	Cook Inlet—northern part	"	1:194,154	35X44
8554	1.00	Cook Inlet—southern part	"	1:200,000	34X42
8556	1.00	Kodiak Island	"	1:350,000	35X46
8859	1.00	Shumagin Islands to Sanak Islands	"	1:300,000	35X42
8860	1.00	Unimak and Akutan Passes and approaches	"	1:300,000	35X44
8861	1.00	Unalaska I. to Amukta I.	"	1:300,000	36X48

* H.O. 903 For sale by the U.S. Navy Hydrographic Office, Washington 25, D.C., and its sales agents.

† Includes Loran Lines of Position

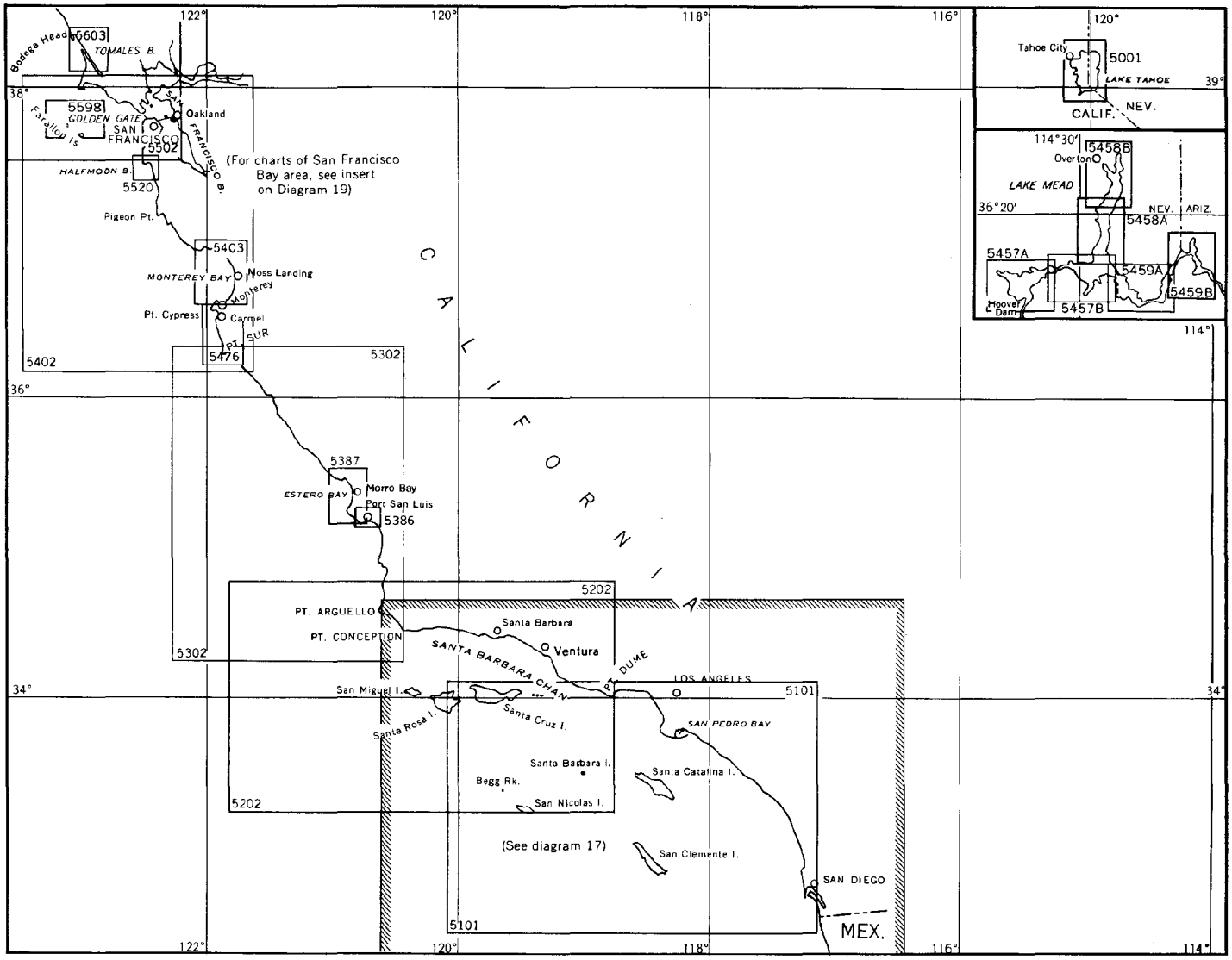


GENERAL, COAST AND HARBOR CHARTS - PACIFIC COAST

SAN DIEGO TO POINT CONCEPTION, CALIFORNIA

GENERAL, COAST AND HARBOR CHARTS—PACIFIC COAST
SAN DIEGO TO POINT CONCEPTION, CALIFORNIA

No.	Price	TITLE	State	Scale	Paper size (inches)
		GENERAL CHARTS			
5101	$1.00	San Diego to Santa Rosa Island	California	1:234,270	35X50
		Camp Del Mar Boat Basin		1:20,000	
5202	1.00	Point Dume to Purisima Point	"	1:232,188	33X48
		HARBOR CHARTS			
5007	.50	Pt. Mugu to Ventura	California	1:40,000	27X30
		Ventura		1:20,000	
		Port Hueneme		1:10,000	
5105	1.00	North San Diego Bay	"	1:12,000	36X46
5107	1.00	San Diego Bay	"	1:20,000	35X43
		Mission Bay		1:20,000	
5108	.75	Newport Bay	"	1:10,000	30X40
5110	.75	Santa Barbara Island	"	1:20,000	34X39
5111	1.00	San Clemente Island	"	1:40,000	35X41
5112	.75	Santa Catalina Island	"	1:40,000	29X40
5113	.75	San Nicolas Island	"	1:40,000	33X43
5114	.50	Anacapa Passage	"	1:40,000	25X39
		Prisoners Harbor		1:20,000	
5115	.75	Santa Cruz Channel	"	1:40,000	33X44
5116	.75	San Miguel Passage	"	1:40,000	30X41
		Cuyler Harbor		1:20,000	
5117	1.00	Pyramid Cove and approaches, San Clemente Island	"	1:15,000	35X46
5118	.75	San Clemente Island—northern part	"	1:20,000	33X34
		Wilson Cove		1:5,000	
5128	.50	Catalina Harbor, Isthmus Cove and Avalon Bay, Santa Catalina Island	"	1:10,000	24X30
5142	1.00	San Pedro Channel	"	1:80,000	34X45
5144	.50	Santa Monica Bay	"	1:40,000	24X36
5147	1.00	Los Angeles and Long Beach Harbors	"	1:12,000	35X46
5148	1.00	San Pedro Bay	"	1:18,000	32X47
5261	.25	Santa Barbara	"	1:20,000	22X28



GENERAL, COAST AND HARBOR CHARTS-PACIFIC COAST

SAN DIEGO TO SAN FRANCISCO BAY, CALIFORNIA

GENERAL, COAST AND HARBOR CHARTS—PACIFIC COAST
SAN DIEGO TO SAN FRANCISCO BAY, CALIFORNIA

No.	Price	TITLE	State	Scale	Paper size (inches)
		GENERAL CHARTS			
5101	$1.00	San Diego to Santa Rosa Island	California	1:234,270	35X50
		Camp Del Mar Boat Basin	"	1:20,000	
5202	1.00	Point Dume to Purisima Point	"	1:232,188	33X48
5302	1.00	Point Conception to Point Sur	"	1:216,116	33X46
†5402	1.00	Point Sur to San Francisco	"	1:210,668	33X42
†5502	1.00	San Francisco to Point Arena	"	1:207,840	34X42
		HARBOR CHARTS			
5386	.25	San Luis Obispo Bay, Port San Luis	California	1:20,000	20X28
5387	.75	Estero Bay	"	1:40,000	30X39
		Morro Bay		1:10,000	
5403	.75	Monterey Bay	"	1:50,000	31X40
		Moss Landing Harbor		1:10,000	
		Monterey Harbor		1:10,000	
5476	.75	Pfeiffer Point to Point Cypress	"	1:40,000	28X44
5520	.25	Halfmoon Bay	"	1:20,000	21X22
5598	.75	Farallon Islands	"	1:40,000	31X40
5603	1.00	Bodega and Tomales Bays	"	1:30,000	35X44
		INLAND CHARTS			
5001	.75	Lake Tahoe	Calif. & Nev.	1:40,000	30X45
5457A	.25	Lake Mead, Boulder Basin	Ariz. & Nev.	1:40,000	21X25
5457B		Lake Mead, Virgin Basin		1:40,000	
5458A	.25	Lake Mead, Overton Arm, southern part	"	1:40,000	18X25
5458B		Lake Mead, Overton Arm, northern part		1:40,000	
5459A	.25	Lake Mead, Temple Bar Area	"	1:40,000	21X25
5459B		Lake Mead, Iceberg Canyon to Lower Granite Gorge		1:40,000	

†Includes Loran Lines of Position.

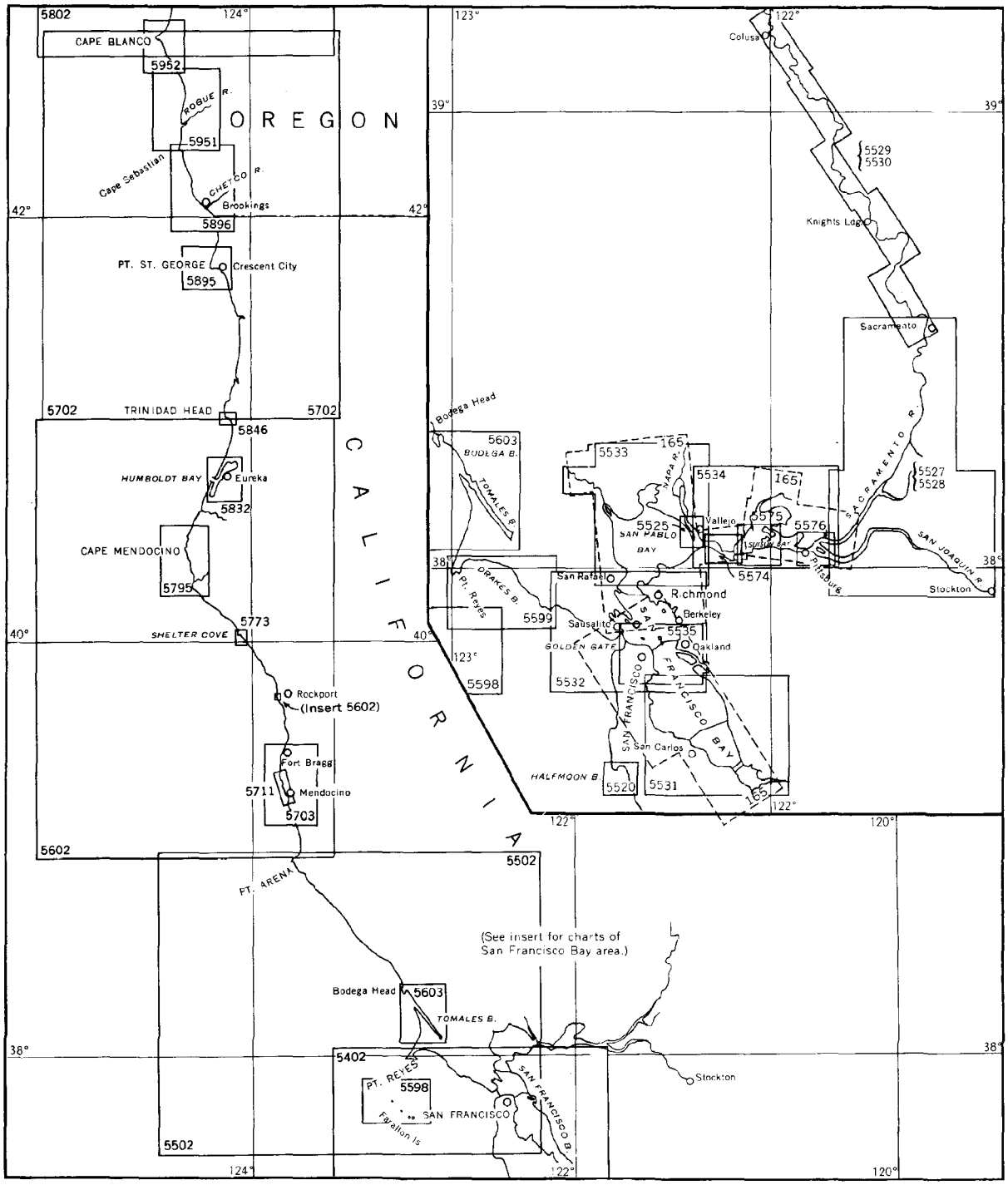
Numbers in brackets represent charts printed back to back.

Diagram No. 19

September 1961

GENERAL, COAST AND HARBOR CHARTS-PACIFIC COAST

SAN FRANCISCO BAY, CALIFORNIA TO CAPE BLANCO, OREGON



GENERAL, COAST AND HARBOR CHARTS—PACIFIC COAST

SAN FRANCISCO BAY, CAL. TO CAPE BLANCO, OREGON

No.	Price	TITLE	State	Scale	Paper size (inches)
		GENERAL CHARTS			
†5402	$1.00	Point Sur to San Francisco	California	1:210,688	33X42
†5502	1.00	San Francisco to Point Arena	"	1:207,840	34X42
†5602	1.00	Point Arena to Trinidad Head	"	1:200,000	33X48
		Rockport Landing		1:10,000	
†5702	1.00	Trinidad Head to Cape Blanco	Calif. & Oreg.	1:196,948	33X43
		HARBOR CHARTS			
5520	.25	Halfmoon Bay	California	1:20,000	21X22
5525	.50	Mare Island Strait	"	1:10,000	25X37
(5527	1.00	San Joaquin River	"	1:40,000	36X48
5528)		Sacramento River—Andrus Island to Sacramento	"	1:40,000	
(5529	1.00	Sacramento River—Sacramento to Fourmile Bend	"	1:20,000	35X43
5530)		Sacramento River—Fourmile Bend to Colusa	"	1:20,000	
5531	1.00	San Francisco Bay—southern part	"	1:40,000	36X43
		Redwood Creek	"	1:20,000	
5532	1.00	San Francisco Entrance	"	1:40,000	36X45
5533	1.00	San Pablo Bay	"	1:40,000	35X43
5534	.75	Suisun Bay	"	1:40,000	31X43
5535	1.00	San Francisco Bay—Candlestick Point to Angel Island	"	1:20,000	36X46
5574	1.00	Carquinez Strait	"	1:10,000	33X43
5575	1.00	Suisun Bay—Port Chicago and vicinity	"	1:10,000	36X44
5576	1.00	Suisun Bay—Mallard Island to Antioch	"	1:10,000	34X44
5598	.75	Farallon Islands	"	1:40,000	3140
5599	.50	Drakes Bay	"	1:40,000	25X32
5603	1.00	Bodega and Tomales Bays	"	1:30,000	3544
5703	1.00	Elk to Fort Bragg	"	1:40,000	3245
		Fort Bragg and Noyo Anchorage		1:10,000	
		Elk		1:10,000	
5711	.75	Albion to Caspar	"	1:10,000	29X40
5773	.25	Shelter Cove	"	1:15,000	15X19
5795	.75	Cape Mendocino and vicinity	"	1:40,000	28X40
5832	.75	Humboldt Bay	"	1:25,000	33X39
5846	.25	Trinidad Harbor	"	1:15,000	17X23
5895	.50	St. George Reef and Crescent City Harbor	"	1:40,000	29X29
		Crescent City Harbor		1:10,000	
5896	1.00	Pyramid Point to Cape Sebastian	Calif. & Oreg.	1:40,000	34X45
		Chetco Cove	Oregon	1:10,000	
		Hunter Cove	"	1:10,000	
5951	.75	Cape Sebastian to Humbug Mountain	"	1:40,000	31X43
5952	.50	Port Orford to Cape Blanco	"	1:40,000	24X29
		SMALL - CRAFT CHART			
165	1.50	San Francisco Bay to Antioch	California	1:80,000 1:40,000	Folio

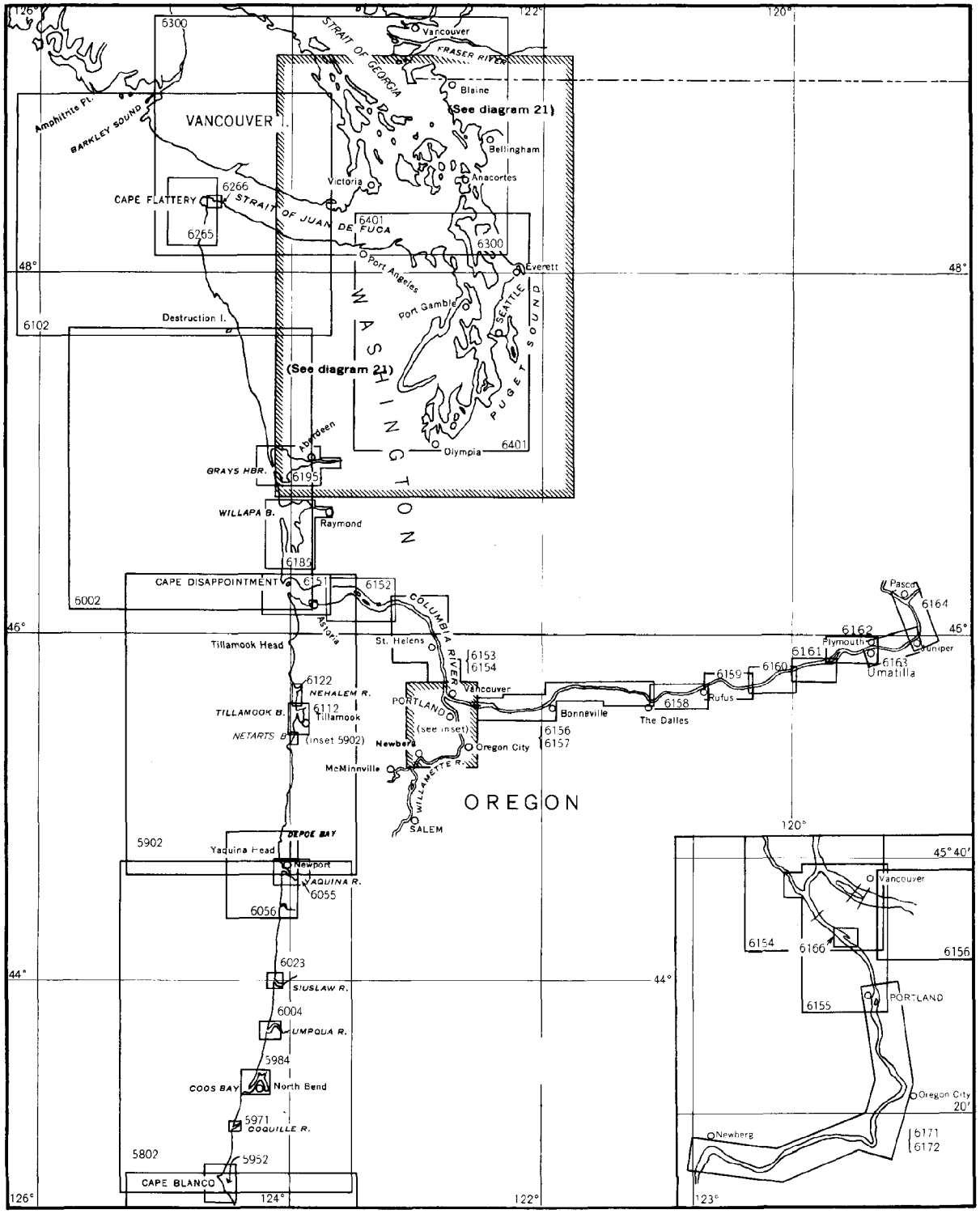
† Includes Loran Lines of Position

Numbers in brackets represent charts printed back to back

GENERAL, COAST AND HARBOR CHARTS-PACIFIC COAST

CAPE BLANCO, OREGON TO CAPE FLATTERY, WASH.

Diagram No. 20
May 1963



GENERAL, COAST AND HARBOR CHARTS—PACIFIC COAST

CAPE BLANCO, OREGON TO CAPE FLATTERY, WASH.

No.	Price	TITLE	State	Scale	Paper size (inches)
		GENERAL CHARTS			
†5802	$1.00	Cape Blanco to Yaquina Head	Oregon	1:191,730	33X48
†5902	1.00	Yaquina Head to Columbia River	Oreg. & Wash.	1:185,238	33X44
		Netarts Bay	Oregon	1:30,000	
†6002	1.00	Columbia River to Destruction Island	Oreg. & Wash.	1:180,789	35X41
†6102	1.00	Approaches to Strait of Juan de Fuca—Destruction Island to Amphitrite Point	Wash. & B.C.	1:176,253	35X44
		Quillayute River Entrance	Washington	1:5,000	
6300	1.00	Strait of Georgia and Strait of Juan de Fuca	Wash. & B.C.	1:200,000	31X44
6401	.75	Admiralty Inlet and Puget Sound	Washington	1:150,000	29X41
		HARBOR CHARTS			
5952	.50	Port Orford to Cape Blanco	Oregon	1:40,000	24X29
5971	.50	Coquille River Entrance	"	1:10,000	24X29
5984	.75	Coos Bay	"	1:20,000	32X43
6004	.50	Umpqua River Pacific Ocean to Reedsport	"	1:20,000	26X33
6023	.25	Siuslaw River	"	1:20,000	20X20
6055	1.00	Yaquina Bay and River	"	1:10,000	36X42
		Continuation of Yaquina River		1:25,000	
6056	1.00	Approaches to Yaquina Bay	"	1:50,000	36X41
		Depoe Bay		1:10,000	
6112	.75	Tillamook Bay	"	1:20,000	30X41
6122	.50	Nehalem River	"	1:20,000	22X35
6151	.75	Columbia River—Pacific Ocean to Harrington Point	Oreg. & Wash.	1:40,000	27X43
6152	.75	Columbia River—Harrington Point to Crims Island	"	1:40,000	28X44
{6153	.75	Columbia River—Crims Island to Saint Helens	"	1:40,000	23X36
6154		Columbia River—Saint Helens to Vancouver	"	1:40,000	
6155	.75	Port of Portland, including Vancouver	"	1:20,000	27X46
		Multnomah Channel—southern part		1:10,000	
{6156	.75	Columbia River—Vancouver to Bonneville	"	1:40,000	32X36
		Bonneville Dam		1:10,000	
6157		Columbia River—Bonneville to The Dalles	"	1:40,000	
		The Dalles		1:10,000	
6158	.50	Columbia River—Lake Celilo	"	1:20,000	29X38
6159	.50	Columbia River—John Day Dam to Blalock	"	1:20,000	29X36
6160	.50	Columbia River—Sundale to Heppner Junction	"	1:20,000	28X36
6161	.50	Columbia River—Thanksgiving I., to Coyote I.	"	1:20,000	28X36
6162	.50	Columbia River—Blalock Island to McNary Dam	"	1:20,000	28X36
6163	.50	Columbia River—McNary Dam to Juniper	"	1:20,000	28X37
6164	.50	Columbia River—Juniper to Pasco	"	1:20,000	29X39
6166	.50	Willamette River—Swan Island Basin	Oregon	1:5,000	29X31
{6171	.75	Willamette River—Portland to Walnut Eddy	"	1:15,000	32X41
6172		Willamette River—Walnut Eddy to Newberg	"	1:15,000	
6185	1.00	Willapa Bay	Washington	1:40,000	33X45
6195	.75	Grays Harbor	"	1:40,000	27X40
		Westhaven Cove		1:10,000	
6265	.75	Cape Flattery	"	1:40,000	31X41
6266	.50	Neah Bay	"	1:10,000	24X30

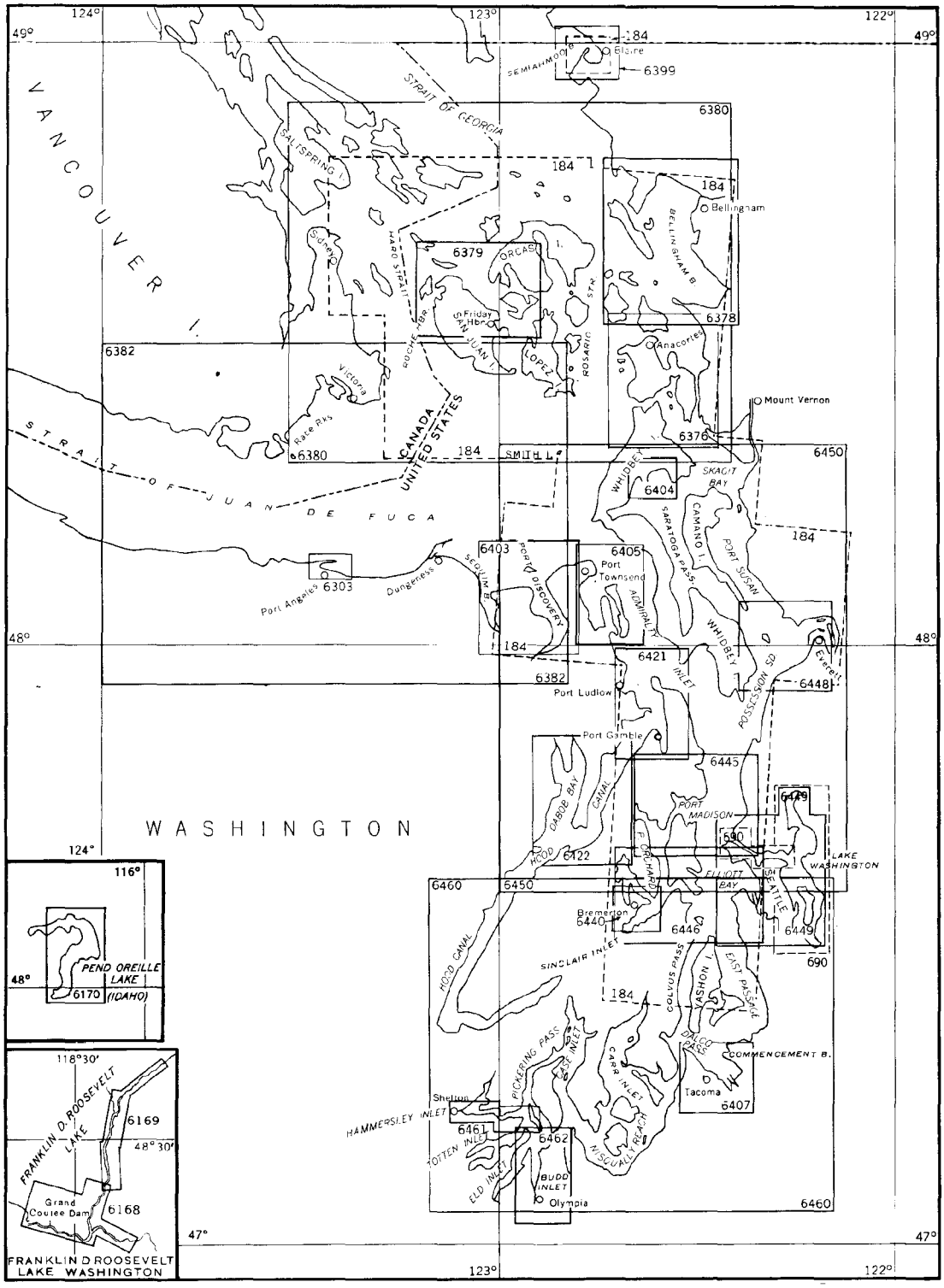
Numbers in brackets represent charts printed back to back.
† Includes Loran Lines of Position.

GENERAL, COAST AND HARBOR CHARTS - PACIFIC COAST

PUGET SOUND AREA

Diagram No. 21

July 1963



GENERAL, COAST AND HARBOR CHARTS—PACIFIC COAST

PUGET SOUND AREA

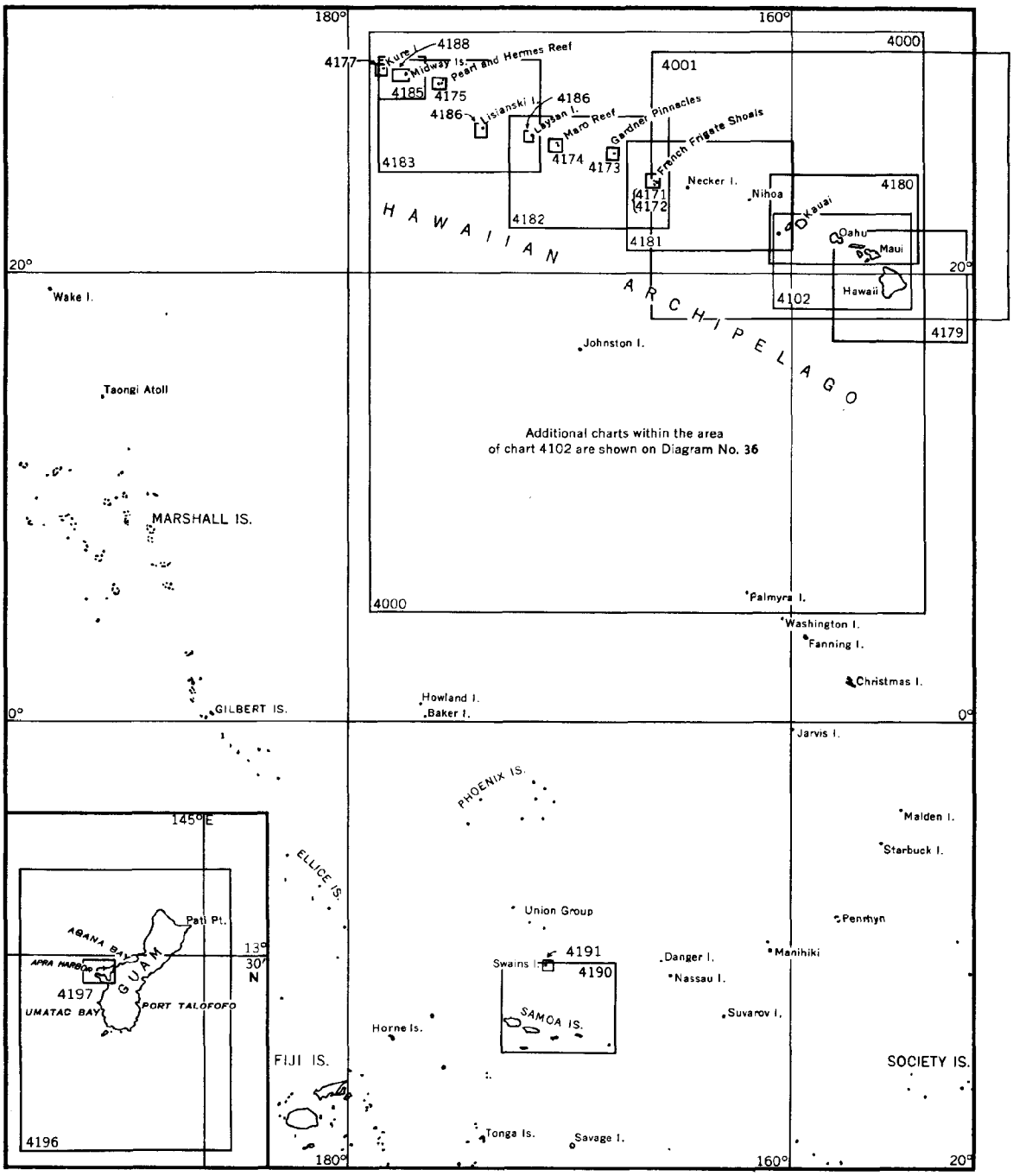
No.	Price	TITLE	State	Scale	Paper size (inches)
		COAST CHARTS			
6380	$1.00	Strait of Juan de Fuca to Strait of Georgia	Wash. & B.C.	1:80,000	36X44
6382	1.00	Strait of Juan de Fuca—eastern part	"	1:80,000	34X46
6450	1.00	Admiralty Inlet and Puget Sound to Seattle	Washington	1:80,000	35X44
6460	.75	Puget Sound—Seattle to Olympia	"	1:80,000	34X41
		HARBOR CHARTS			
6303	.50	Port Angeles	Washington	1:10,000	22X29
6376	1.00	Anacortes to Skagit Bay (shows Swinomish Slough and connecting waterways on large scale)	"	1:25,000	35X41
6378	.50	Bellingham Bay	"	1:40,000	28X33
6379	.75	San Juan Channel—Friday and Roche Harbors	"	1:20,000	34X48
6399	.25	Semiahmoo Bay	"	1:30,000	17X18
6403	.25	Port Discovery and Sequim Bay	"	1:40,000	21X24
6404	.75	Oak and Crescent Harbors	"	1:10,000	33X38
6405	.75	Port Townsend	"	1:20,000	28X38
6407	.75	Tacoma Harbor	"	1:15,000	28X40
6421	.75	Hood Canal—Port Ludlow to South Point	"	1:20,000	30X40
6422	.75	Hood Canal—South Point to Quatsap Point, including Dabob Bay	"	1:25,000	33X40
6440	.50	Sinclair Inlet	"	1:10,000	25X34
6445	.75	Puget Sound—Apple Cove Point to Keyport	"	1:25,000	34X41
		Agate Passage		1:10,000	
6446	1.00	Puget Sound—Seattle to Bremerton	"	1:25,000	32X48
6448	.25	Everett Harbor and approaches	"	1:40,000	19X23
6449	1.00	Seattle Harbor and Lake Washington	"	1:25,000	34X43
6461	.75	Puget Sound—Hammersley Inlet to Shelton	"	1:10,000	30X38
6462	.50	Olympia Harbor and Budd Inlet	"	1:20,000	22X39
		INLAND CHARTS			
6168	1.00	Franklin D. Roosevelt Lake, southern part	Washington	1:50,000	35X45
6169	.75	Franklin D. Roosevelt Lake, northern part	"	1:50,000	31X35
6170	.75	Pend Oreille Lake	Idaho	1:50,000	26X40
		SMALL-CRAFT CHART			
184	2.00	Bellingham to Seattle	Washington	1:80,000	Folio
690	.50	Lake Washington Ship Canal	"	1:10,000	"
		Lake Washington		1:25,000	

691 - 231 O - 63 - 22

Diagram No. 35

December 1958

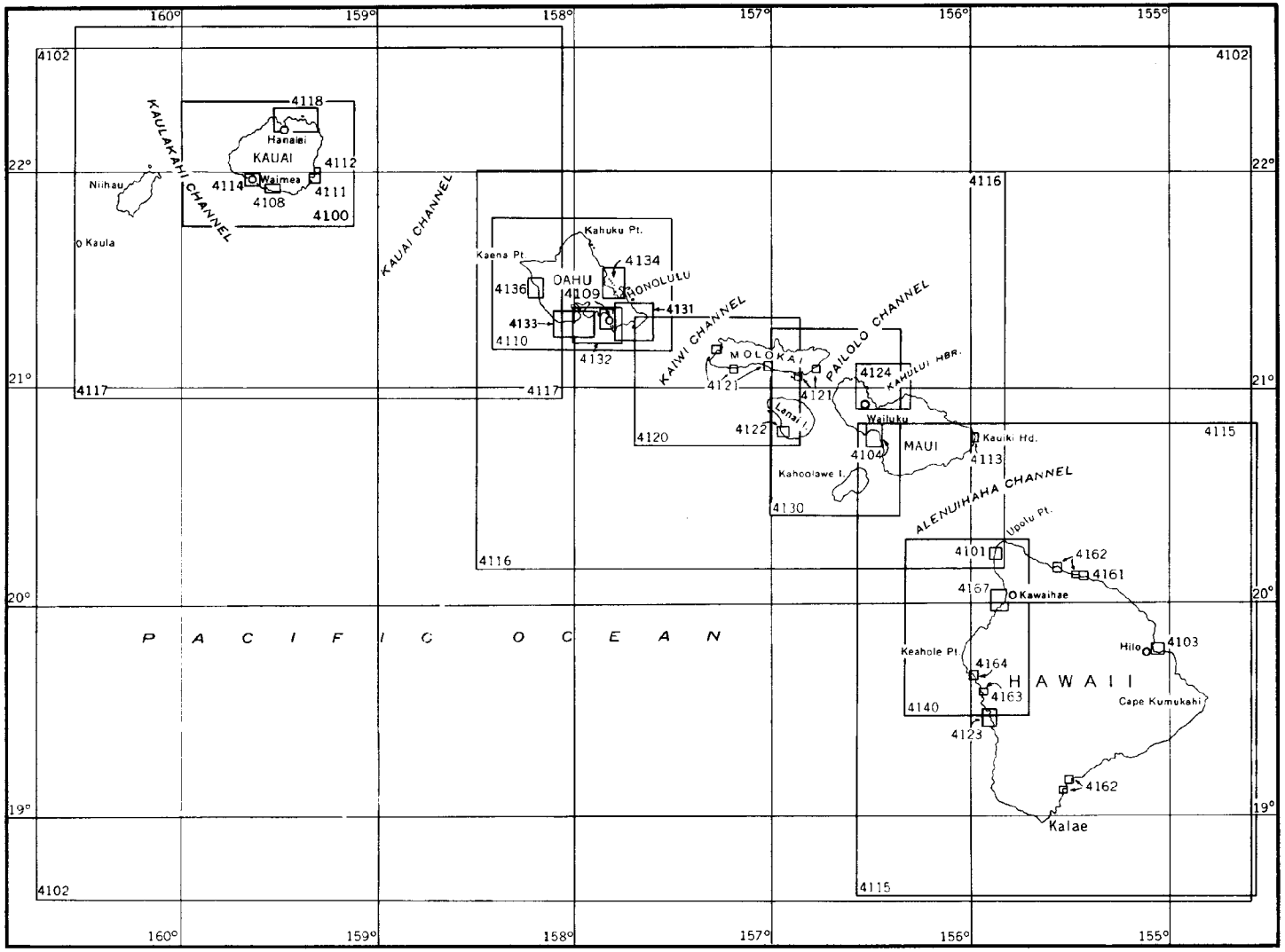
CHARTS OF THE HAWAIIAN ARCHIPELAGO, GUAM AND SAMOA



CHARTS OF THE HAWAIIAN ARCHIPELAGO, GUAM AND SAMOA

No.	Price	TITLE	Scale	Paper size (inches)
		SAILING AND GENERAL CHARTS		
4000	$0.75	Hawaiian Archipelago	1:3,121,170	36X41
†4001	1.00	Hawaii to French Frigate Shoals—Hawaiian Archipelago	1:1,650,000	35X42
4102	1.00	Hawaiian Islands	1:600,000	32X46
4179	.75	Hawaiian Islands—southern part	1:675,000	35X39
4180	.75	Hawaiian Islands—northern part	1:675,000	30X46
4181	1.00	Niihau to French Frigate Shoals, Hawaiian Archipelago	1:663,392	34X48
		Necker Island	1:20,000	
		Nihoa	1:20,000	
4182	1.00	French Frigate Shoals to Laysan I., Hawaiian Archipelago	1:653,219	34X46
4183	1.00	Laysan Island to Kure Island, Hawaiian Archipelago	1:642,271	34X48
4185	1.00	Midway Islands and approaches, Hawaiian Archipelago	1:180,000	36X47
		COAST CHARTS		
4172	1.00	French Frigate Shoals, Hawaiian Archipelago	1:80,000	35X48
4173	1.00	Gardner Pinnacles and approaches, Hawaiian Archipelago	1:100,000	32X48
		Gardner Pinnacles	1:20,000	
4174	.75	Maro Reef, Hawaiian Archipelago	1:80,000	30X37
4196	1.00	Island of Guam, Marianas	1:100,000	35X48
		HARBOR CHARTS		
4171	1.00	French Frigate Shoals Anchorage, Hawaiian Archipelago	1:25,000	33X48
4175	1.00	Pearl and Hermes Reef, Hawaiian Archipelago	1:40,000	34X44
4177	.50	Kure Island, Hawaiian Archipelago	1:20,000	29X34
4186	1.00	Lisianski and Laysan Islands, Hawaiian Archipelago	1:40,000	36X46
		West Coast of Laysan I.	1:10,000	
4188	1.00	Midway Islands, Hawaiian Archipelago	1:32,500	32X47
4191	.75	Swains Island	1:20,000	29X40
4197	1.00	Apra Harbor, Marianas-Guam	1:10,000	34X47
		COMBINED GROUP CHART		
4190	1.00	United States possessions in the Samoa Islands (5 plans)		35X41
		Manua Islands	1:80,000	
		Pago Pago Harbor, Tutuila Island	1:15,000	
		Samoa Islands	1:2,000,000	
		Rose Island	1:80,000	
		Tutuila Island	1:60,000	

† Includes Loran Lines of Position



CHARTS OF THE HAWAIIAN ISLANDS

HAWAII TO NIIHAU

Diagram No. 36

August 1962

CHARTS OF THE HAWAIIAN ISLANDS
HAWAII TO NIIHAU

No.	Price	TITLE	Island	Scale	Paper size (inches)
		SAILING CHART			
4102	$1.00	Hawaiian Islands		1:600,000	32X46
		GENERAL CHARTS			
4115	1.00	Hawaii		1:250,000	36X42
4116	1.00	Hawaii to Oahu		1:250,000	36X47
4117	1.00	Oahu to Niihau		1:247,482	34X44
		COAST CHARTS			
4100	1.00	Kauai	Kauai	1:80,000	35X48
4110	1.00	Oahu		1:80,000	36X47
4120	1.00	Channels between Oahu, Molokai and Lanai		1:80,000	35X47
4130	1.00	Channels between Molokai, Maui, Lanai and Kahoolawe		1:80,000	34X46
4140	1.00	West Coast of Hawaii—Cook Pt. to Upolu Pt.		1:80,000	35X48
		HARBOR CHARTS			
4101	.25	Mahukona Harbor and approaches	Hawaii	1:5,000	19X25
4103	.50	Hilo Bay	"	1:10,000	28X28
4104	1.00	Maalaea Bay	Maui	1:10,000	33X42
4108	.25	Port Allen	Kauai	1:5,000	22X30
4109	1.00	Honolulu Harbor	Oahu	1:5,000	37X46
4111	.50	Nawiliwili Bay	Kauai	1:5,000	25X33
4112	.75	Hanamaulu Bay	"	1:2,500	29X35
4113	.25	Hana Bay	Maui	1:5,000	19X20
4114	.75	Approach to Waimea and Makaweli Landings	Kauai	1:10,000	30X37
4118	.75	Haena Point to Kepuhui Point	"	1:20,000	31X46
4121	.75	Harbors of Molokai (5 plans)	Molokai		31X36
		Kaunakakai Harbor		1:5,000	
		Pukoo Harbor		1:5,000	
		Kamalo Harbor		1:5,000	
		Kolo Harbor		1:5,000	
		Papohaku Roadstead		1:5,000	
4122	.25	Kaumalapau Harbor	Lanai	1:2,500	17X21
4123	.50	Kealakekua Bay to Honaunau Bay	Hawaii	1:10,000	27X36
4124	.75	Kahului Harbor and approaches	Maui	1:30,000	30X39
		Kahului Harbor		1:10,000	
4131	1.00	Southeast Coast of Oahu—Waimanalo Bay to Diamond Head	Oahu	1:20,000	36X46
4132	1.00	South Coast of Oahu—Diamond Head to Pearl Harbor Entrance	"	1:20,000	36X45
4133	.75	South Coast of Oahu—Ahua Point to Barbers Point	"	1:20,000	30X44
4134	1.00	East Coast of Oahu—Kaneohe Bay	"	1:15,000	32X45
4136	.75	Port Waianae	"	1:10,000	30X41
4161	.50	Paauhau Landing	Hawaii	1:5,000	22X30
4162	.75	Harbors and Landings, Hawaii (4 plans)	"		32X35
		Punaluu Harbor		1:2,500	
		Honuapo Harbor		1:2,500	
		Honokaa Landing		1:2,500	
		Kukuihaele Landing		1:2,500	
4163	.25	Keauhou Bay—West Coast of Hawaii	Hawaii	1:2,500	21X26
4164	.25	Kailua Bay—West Coast of Hawaii	"	1:5,000	22X22
4167	1.00	Kawaihae Bay—West Coast of Hawaii	"	1:10,000	36X45

INTERNATIONAL NAUTICAL MILES TO STATUTE MILES

1 nautical mile 6,076.10 feet or 1,852 meters 1 statute mile = 5,280 feet or 1,609.35 meters

Nautical miles	0	1	2	3	4	5	6	7	8	9
0	0.000	1.151	2.302	3.452	4.603	5.754	6.905	8.055	9.206	10.357
10	11.508	12.659	13.809	14.960	16.111	17.262	18.412	19.563	20.714	21.865
20	23.016	24.166	25.317	26.468	27.619	28.769	29.920	31.071	32.222	33.373
30	34.523	35.674	36.825	37.976	39.126	40.277	41.428	42.579	43.730	44.880
40	46.031	47.182	48.333	49.483	50.634	51.785	52.936	54.087	55.237	56.388
50	57.539	58.690	59.840	60.991	62.142	63.293	64.444	65.594	66.745	67.896
60	69.047	70.197	71.348	72.499	73.650	74.801	75.951	77.102	78.253	79.404
70	80.554	81.705	82.856	84.007	85.158	86.308	87.459	88.610	89.761	90.911
80	92.062	93.213	94.364	95.515	96.665	97.816	98.967	100.118	101.268	102.419
90	103.570	104.721	105.871	107.022	108.173	109.324	110.475	111.625	112.776	113.927

STATUTE MILES TO INTERNATIONAL NAUTICAL MILES

Statute miles	0	1	2	3	4	5	6	7	8	9
0	0.000	0.869	1.738	2.607	3.476	4.345	5.214	6.083	6.952	7.821
10	8.690	9.559	10.428	11.297	12.166	13.035	13.904	14.773	15.642	16.511
20	17.380	18.249	19.118	19.986	20.855	21.724	22.593	23.462	24.331	25.200
30	26.069	26.938	27.807	28.676	29.545	30.414	31.283	32.152	33.021	33.890
40	34.759	35.628	36.497	37.366	38.235	39.104	39.973	40.842	41.711	42.580
50	43.449	44.318	45.187	46.056	46.925	47.794	48.663	49.532	50.401	51.270
60	52.139	53.008	53.877	54.746	55.615	56.484	57.353	58.222	59.091	59.959
70	60.828	61.697	62.566	63.435	64.304	65.173	66.042	66.911	67.780	68.649
80	69.518	70.387	71.256	72.125	72.994	73.863	74.732	75.601	76.470	77.339
90	78.208	79.077	79.946	80.815	81.684	82.553	83.422	84.291	85.160	86.029

FEET TO METERS

Feet	0	1	2	3	4	5	6	7	8	9
0	0.00	0.30	0.61	0.91	1.22	1.52	1.83	2.13	2.44	2.74
10	3.05	3.35	3.66	3.96	4.27	4.57	4.88	5.18	5.49	5.79
20	6.10	6.40	6.71	7.01	7.32	7.62	7.92	8.23	8.53	8.84
30	9.14	9.45	9.75	10.06	10.36	10.67	10.97	11.28	11.58	11.89
40	12.19	12.50	12.80	13.11	13.41	13.72	14.02	14.33	14.63	14.93
50	15.24	15.54	15.85	16.15	16.46	16.76	17.07	17.37	17.68	17.98
60	18.29	18.59	18.90	19.20	19.51	19.81	20.12	20.42	20.73	21.03
70	21.34	21.64	21.95	22.25	22.55	22.86	23.16	23.47	23.77	24.08
80	24.38	24.69	24.99	25.30	25.60	25.91	26.21	26.52	26.82	27.13
90	27.43	27.74	28.04	28.35	28.65	28.96	29.26	29.57	29.87	30.17

METERS TO FEET

Meters	0	1	2	3	4	5	6	7	8	9
0	0.00	3.28	6.56	9.84	13.12	16.40	19.68	22.97	26.25	29.53
10	32.81	36.09	39.37	42.65	45.93	49.21	52.49	55.77	59.06	62.34
20	65.62	68.90	72.18	75.46	78.74	82.02	85.30	88.58	91.86	95.14
30	98.42	101.71	104.99	108.27	111.55	114.83	118.11	121.39	124.67	127.95
40	131.23	134.51	137.80	141.08	144.36	147.64	150.92	154.20	157.48	160.76
50	164.04	167.32	170.60	173.88	177.16	180.45	183.73	187.01	190.29	193.57
60	196.85	200.13	203.41	206.69	209.97	213.25	216.54	219.82	223.10	226.38
70	229.66	232.94	236.22	239.50	242.78	246.06	249.34	252.62	255.90	259.19
80	262.47	265.75	269.03	272.31	275.59	278.87	282.15	285.43	288.71	291.99
90	295.28	298.56	301.84	305.12	308.40	311.68	314.96	318.24	321.52	324.80

U. S. GOVERNMENT PRINTING OFFICE: 1963 O - 691-231