Search and Rescue (SAR) Operations & Commercial Fishing Vessels

Captain Holly Harrison, USCG (retired): 34 years active duty (1991 – 2025)

Afloat Operations, incl SAR (12+ years):

- Commanding Officer, 419' cutter (HI))
- Commanding Officer, 270' cutter (VA)
- Executive Officer, 270' cutter (VA)
- Commanding Officer, 110' Patrol Boat (NC & Manama, Bahrain)
- Executive Officer, 110' Patrol Boat (HI)
- Assistant Operations Officer, 230' cutter (AK)

Search & Rescue Oversight:

- Pacific NW (District 13) Chief of Staff (2023-2025)
- Pacific SW (District 11) Chief of Response (2021-2023)
- ACTSUS (Active Suspension) Authority

Commercial Fishing Vessels:

- Safety Regulations & Fisheries Enforcement (including IUU)
- Alaska/Bering Sea, New England, Mid-Atlantic, Caribbean, West Coast, Hawaii/Oceania
- US & Foreign vessels
- Commercial & Recreational vessels
- Prior Commercial Fishing Vessel Safety Examiner

Fishing 101

- **Dept of Commerce (Federal waters) & States (State waters):**
  - Scientific research determines the locations & health of fish populations
  - Set rules for Commercial & Recreational fishing, including WHEN, WHERE and HOW
  - Update rules based on new evidence
    - How will climate change & fishing activity (legal & IUU) impact fisheries?
    - Impact of cuts to Federal staffing & scientific research (fisheries & climate)?
    - Reduction/removal of Federal regulatory oversight?

- **USCG: Enforces USCG Safety Regulations & Assists w/Fisheries Enforcement at Sea**

WHEN: Seasonality Highlights

- **Winter:**
  - Dungeness crab (starts Dec), limited groundfish
- **Spring:**
  - Shrimp and sablefish (pots), early salmon
- **Summer:**
  - Tuna (albacore), salmon (trolling), groundfish
- **Fall:**
  - Continued tuna and groundfish, crab gear prep

WHERE: Primary Fishing Locations

- **California:**
  - **Monterey Bay & Santa Barbara Channel:** Coastal pelagics, squid
  - **Eureka/Fort Bragg:** Salmon, groundfish, crab
  - **San Pedro/Los Angeles:** Tuna, squid, sardines
- **Oregon:**
  - **Newport, Coos Bay, Astoria:** Dungeness crab, albacore, groundfish
  - Nearshore fisheries for black rockfish and other reef species
- **Washington:**
  - **Westport, Ilwaco, Neah Bay:** Salmon, tuna, crab, halibut
  - **Puget Sound:** Small-boat fisheries, shellfish, limited gillnetting
- **Offshore EEZ (Exclusive Economic Zone):**
  - Midwater trawl fisheries for Pacific hake (whiting)
  - Tuna fisheries extending far offshore during summer months

Fishing 101: HOW

Types of Fishing Vessels:

- **Trawlers**
  - *Use:* Groundfish, shrimp
  - *Size:* Medium to large (40–100 ft)
  - *Notes:* Freezer trawlers or wetfish haulers; may be federally permitted for Pacific Groundfish
- **Longliners**
  - *Use:* Sablefish (black cod), halibut, occasionally tuna
  - *Size:* Typically 30–80 ft
  - *Notes:* Common in deeper offshore fisheries
- **Purse Seiners**
  - *Use:* Coastal pelagics (sardines, anchovy, mackerel)
  - *Size:* Medium to large
  - *Notes:* Most active off Southern and Central California
- **Gillnetters**
  - *Use:* Salmon, swordfish, shark (restricted in some areas)
  - *Size:* Small to mid-sized
  - *Notes:* More heavily regulated due to bycatch concerns
- **Trollers (Salmon/Tuna)**
  - *Use:* Albacore tuna, Chinook/Coho salmon
  - *Size:* Small to medium
  - *Notes:* Common along the entire coast, especially in Oregon and Northern California
- **Pot/Trap Vessels**
  - *Use:* Dungeness crab, sablefish, spot prawn
  - *Size:* Small to medium
  - *Notes:* High seasonal activity, especially in winter (crab) & spring (shrimp)

Types of Gear

- **Bottom trawl:** For groundfish and shrimp, involves dragging nets along the seabed
- **Midwater trawl:** Used for pelagic deep-dwelling fish
- **Purse seine:** Encircling net for schooling fish near the surface
- **Gillnet:** Suspended net that entangles fish; usage varies by state
- **Troll lines:** Multiple baited lures towed behind the vessel
- **Pots/Traps:** Steel or wire cages for crab, shrimp, and sablefish

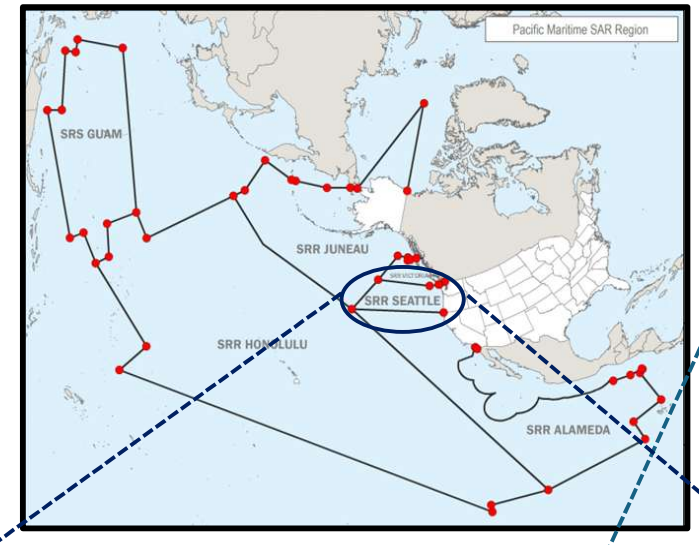
USCG SAR Readiness

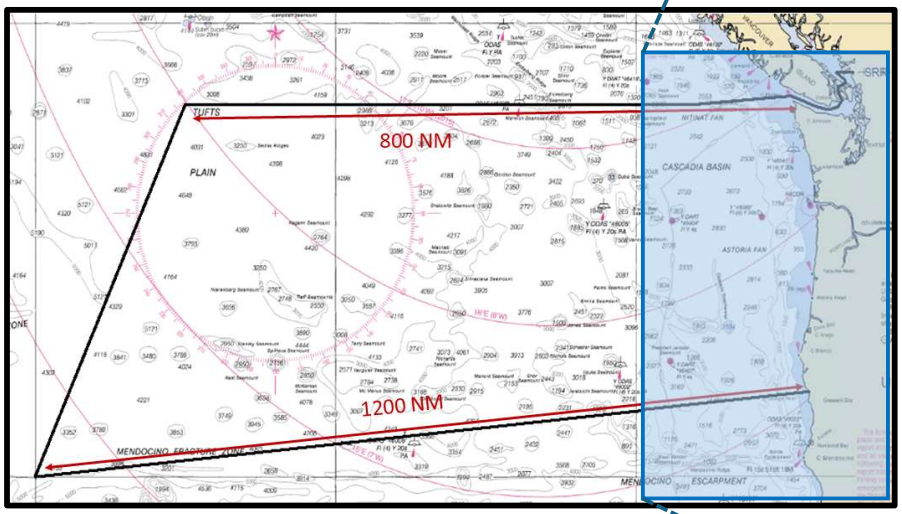
USCG Prepositions Assets to Maximize SAR Response Capability

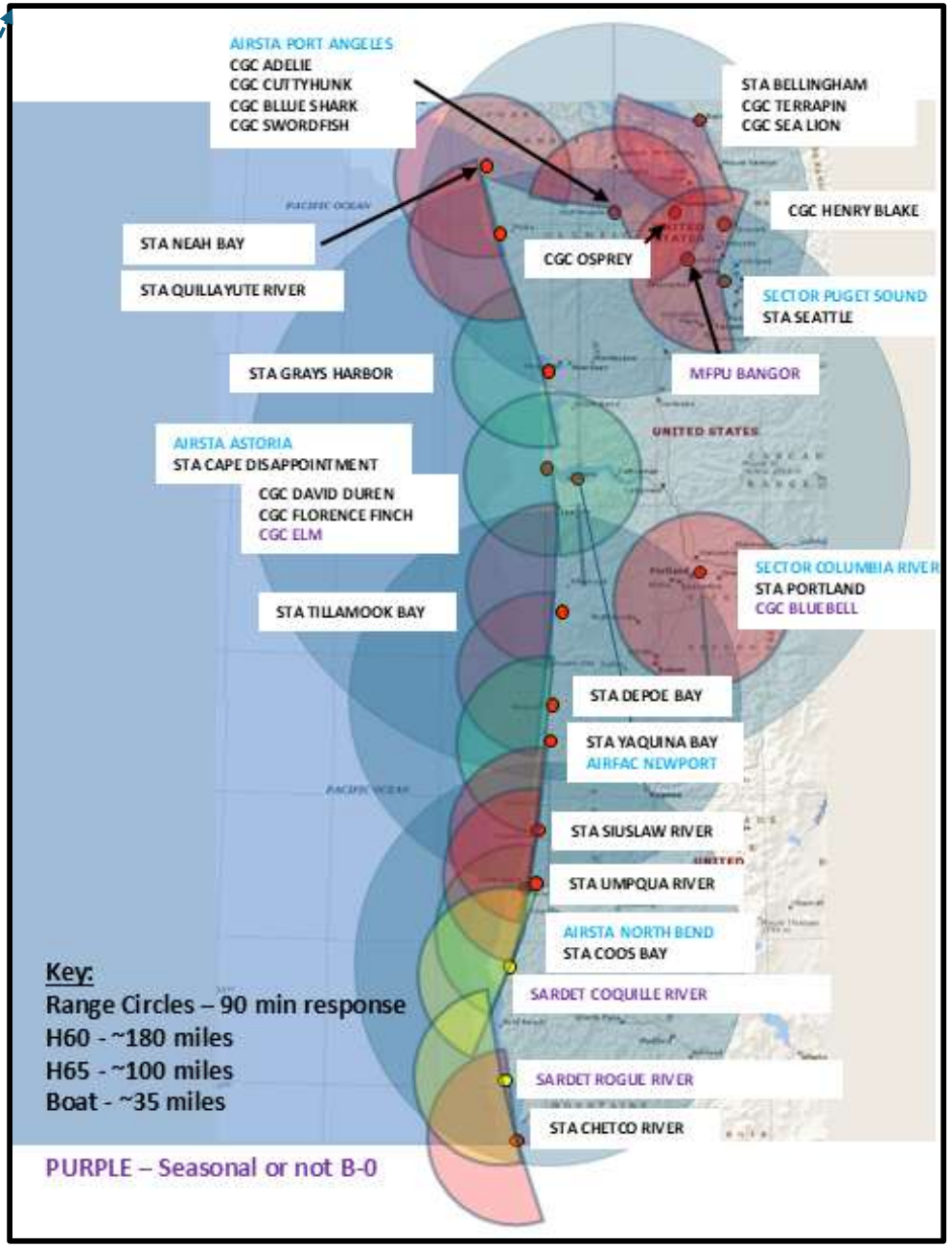
Variables Include:

- Comprehensive assessment of maritime activity in the region
- Available USCG assets and capabilities
- Asset response time
- Historic & current fisheries location data: find the fish, find the fishermen
- Historic & current (AIS, VMS, observations) vessel location & activity data
- High risk fishery? (quota vs. derby style fishing, type of gear, historic data)
- Areas with heavy concentrations of vessels
- Other maritime activity (recreational, shipping, military)
- Weather / Environment
- Availability of non-USCG assets for rescue

USCG SAR Readiness: District 13 (PNW) Example







SAR Readiness: Challenges

- **Limited Assets:**
  - Flight hour restrictions on helicopters, limited/no fixed wing assets on the West Coast
  - Aging assets & lack of parts/funding impact maintenance & repair -> reduce asset availability
  - **Offshore SAR:** No persistent offshore surface search or response, limited aviation capability

- **Extreme Environments:**
  - Requires advanced assets and skills.
  - **North of San Francisco, most ports prone breaking bars, surf, hurri**cane force lows & winds, especially October - April.
    - In most of the PNW, USCG is the only capable responder
    - **Response through surf requires a2 surf-capable boats.**
    - **No Replacement for 52' Heavy Weather Boat:** No surf capable, heavy tow asset
  - **Aviation SAR:** Challenged by extreme weather, offshore, surf & vertical surface rescues
  - **87' Patrol Boats:** Limited near/offshore response

- **Other USCG Missions:**
  - **Inland Aviation SAR:** Multiple cases per year in mountainous terrain (PNW, Northern CA)
  - Assets & personnel prioritized for other USCG & DHS missions (hurricane response, migrant/drug interdiction, alien expulsion operations)

SEARCH: Key Information Needed

Initial Notification Sources:

- **EPIRBs (Emergency Position-Indicating Radio Beacons):** Transmit distress signals via satellite (COSPAS-SARSAT), including GPS location
- **VHF Radio (e.g., Channel 16):** Voice communication with initial position, nature of distress/help needed or relay by others?
- **Rescue 21:** USCG's coastal direction finding system for VHF transmissions (Channels 16 & 70)
- **AIS (Automatic Identification System):** Provides vessel position, speed, heading, and identity—if transmitting
- **Satellite Communications / Cell Phone GPS:** When available, offers precise last known location or updates
- **Social Media / Email / Messaging Apps:** Increasingly used for distress communication, especially via mobile networks near shore

Key Search Area Variables

- **LKP (Last Known Position):** Critical starting point for search! Can be from GPS, AIS, radar, visual report, or estimated from voyage plan. Time Since Last Contact helps define how far the subject might have drifted
- **Environmental Drift Models:** Account for ocean currents, wind, and leeway to estimate the probable location over time
- **Vessel Type and Behavior:** Speed, floatation or submersion tendencies
- **Person Characteristics:** Fitness level, type of clothing, survival gear, water temperature
- **Vessel Operation:** Likely fishing areas, patterns of behavior, equipment aboard, condition of vessel
- **Witness Reports:** Visual sightings, flares, debris
- **Previous Records:** RCCs (Rescue Coordination Centers) access previous incidents, vessel registries, and communication logs

SEARCH Planning: An Art & Science

SAROPS (Search and Rescue Optimal Planning System): USCG's decision-support system that runs **Monte Carlo simulations** to generate **probability maps** for locating a search object. Key variables:

Environmental Inputs

- **Surface Currents:** From NOAA models or buoys (e.g., HYCOM, ROMS)
- **Wind Data:** From NWS or models (affects drift/leeway)
- **Wave Height & Direction:** Affects capsizing or survival times
- **Tides:** Localized impacts, especially near inlets or estuaries

Object-Specific Data

- **Object Type:** Different items (e.g., life raft, PFD, person in water) drift differently
  SAROPS uses "drift polars" for over 100 object types.
- **Drift Characteristics (Leeway):** Wind effect on the object; varies by size, shape, waterline exposure
- **Survivability Data:** Used to prioritize urgency (e.g., hypothermia timelines)

Search Asset Parameters

- **Sensor effectiveness:** Radar, visual detection ranges, altitude, sweep width
- **Search pattern & coverage:** Determines how thoroughly areas are scanned
- **Asset speed and endurance**

Probabilistic Modeling

- **Monte Carlo Particles:** Thousands of simulated drifters run forward in time from the LKP
- **Bayesian Updating:** Incorporates negative search results (nothing found) to refine future predictions

SEARCH: Challenges

- **Asset Availability, Capability and On Scene Time**
- **Delayed Distress Notification** → Larger search area
- **Incorrect LKP or other variables** → Errors compound over time
- **No Tracking Beacon** → Relies entirely on estimates
- **Environmental Variability** → Complex current/wind changes reduce model accuracy
- **Heavy Weather** → Wind, seas and current increase drift and make spotting more difficult
- **Object Size / Color** → Smaller objects & non-bright colors are difficult to spot at sea
- **Accuracy of Search Pattern Completion**
- **Accuracy of Local Area Knowledge**

RESCUE

Types of Assistance

- **Assist Vessel/Crew:** Deliver personnel and pumps, medical & other equipment
- **Personnel Rescue:** Retrieve personnel from the vessel/water. Vessel left adrift and/or sinks
- **Tow Vessel/Crew:** Hook up is particularly tricky/dangerous and time consuming, especially in larger seas and with larger vessels.

Air Assets

- Search: Primarily USCG
  - Occasional assistance from US Navy & Canadian Coast Guard.
  - Few other agencies available/comfortable flying offshore.
- Rescue: Only rescue option via air is hoist capable helicopters.
  - Few capable alternatives (USN H60s & Canadian Coast Guard)
  - USAF Pararescue PJ medics delivered via parachute for extreme offshore personnel injuries (cases take several days). Must transit to w/in helo hoist range for medevac

Afloat Assets

- US Coast Guard – Small boats, Small cutters, Large Cutters
- Other Agencies: Local Fire, Police, Fish & Wildlife, US Navy, Canadian CG
- Commercial Tugs / Salvage: Available? Capabilities?
- Other Mariners: AMVER, Good Samaritans: Skill?

Offshore Structures/Hazards to Navigation

Operations:

- Larger vessels need more standoff distance from hazards to navigation (HAZNAV): bridges, jettys, shoal water, buoys, offshore structures
- How accurate is the object position? (buoys vs. fixed structures)
- Overhead clearance? (bridges)
- Operations close to HAZNAV require more crew/focus on safe navigation

Search & Assistance Operations:

- SAROPS cannot account for obstacles and search asset standoff distances
- Larger standoff distance negatively affects ability to complete SAROPS search pattern
- Less likely to spot smaller objects or objects in heavy seas
- Radar & other sensors blocked by obstacles
- Wind & seas greatly affect ability to launch & recover helicopters & small boats. If obstacles in the required launch/recovery path, operations will be restricted.

Towing of Disabled Vessels:

- At mercy of environmental conditions WRT direction/rate of drift
- Towing vessels must match disabled vessel's direction/rate of drift for hook up
- Larger vessels need more room & time to establish tow
- A towline fouling on screws could hazard both vessels

TOWEX: Line throwing gun to send messenger line to disabled vessel

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TOWEX: Disabled vessel retrieves messenger

TOWEX: Disabled vessel hauls the shot line & messenger aboard

TOWEX: Messenger paid out to avoid excess line in the water

TOWEX: Towline passed via messenger & hooked up

TOWEX: Towed vessel placed “in step”

TOWEX: Retrieving towline after disconnect

TOWEX: USS KAUFFMAN Prepares to Tow 270’ USCGC LEGARE

Small Boat Ops: Dual Point Davit

Small Boat Ops: Dual Point Davit

Small Boat Ops: Dual Point Davit

Small Boat Ops: Dual Point Davit

Small Boat Ops: Dual Point Davit

Small Boat Ops: Dual Point Davit

Small Boat Ops: Stern Launch

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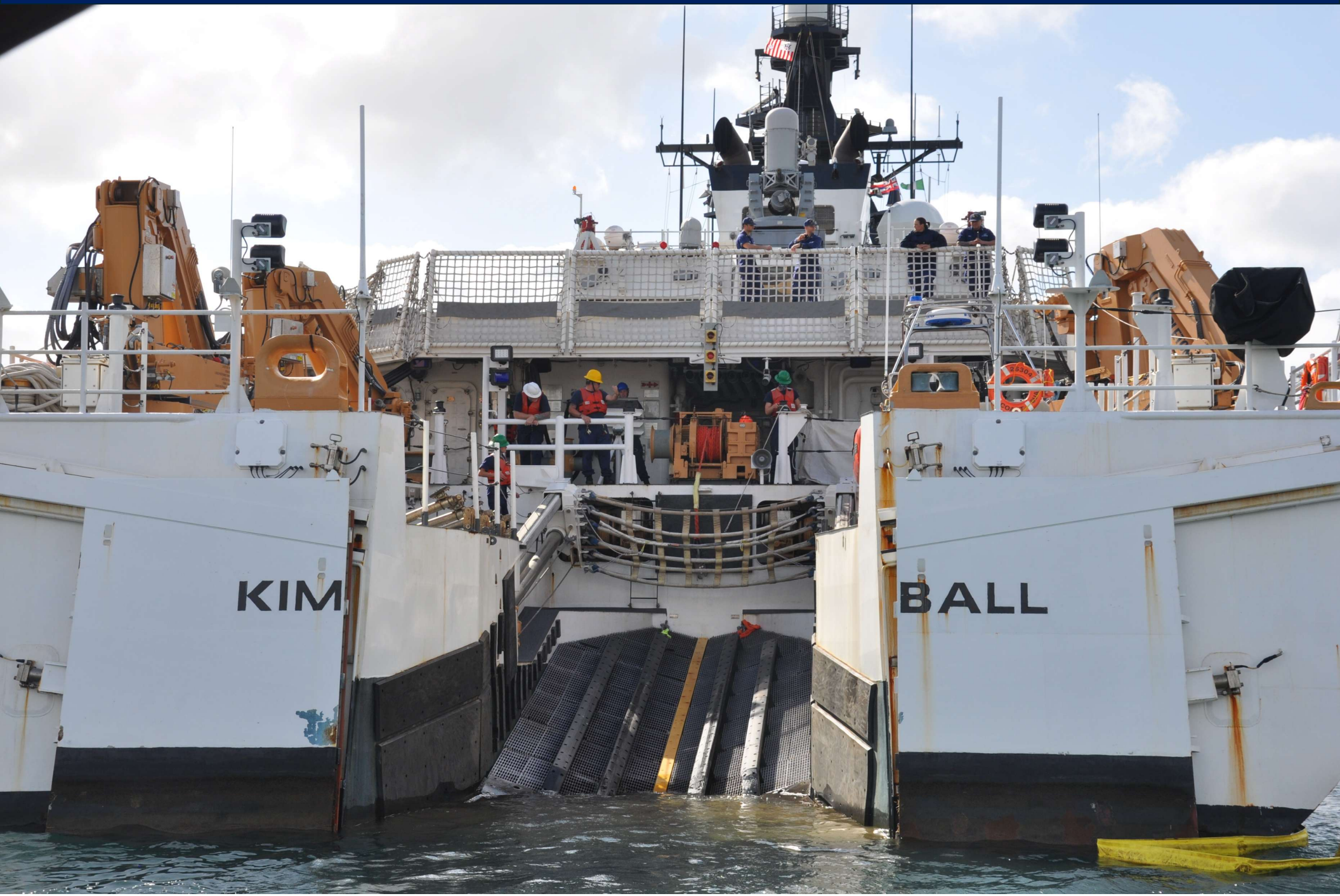


USCGC LEGARE Refueling Alongside USNS LARAMIE @ 12 knots

USCGC KIMBALL Small Boat & Taiwanese F/V

Adrift Overturned Vessel off Oregon Coast – Aug 2024

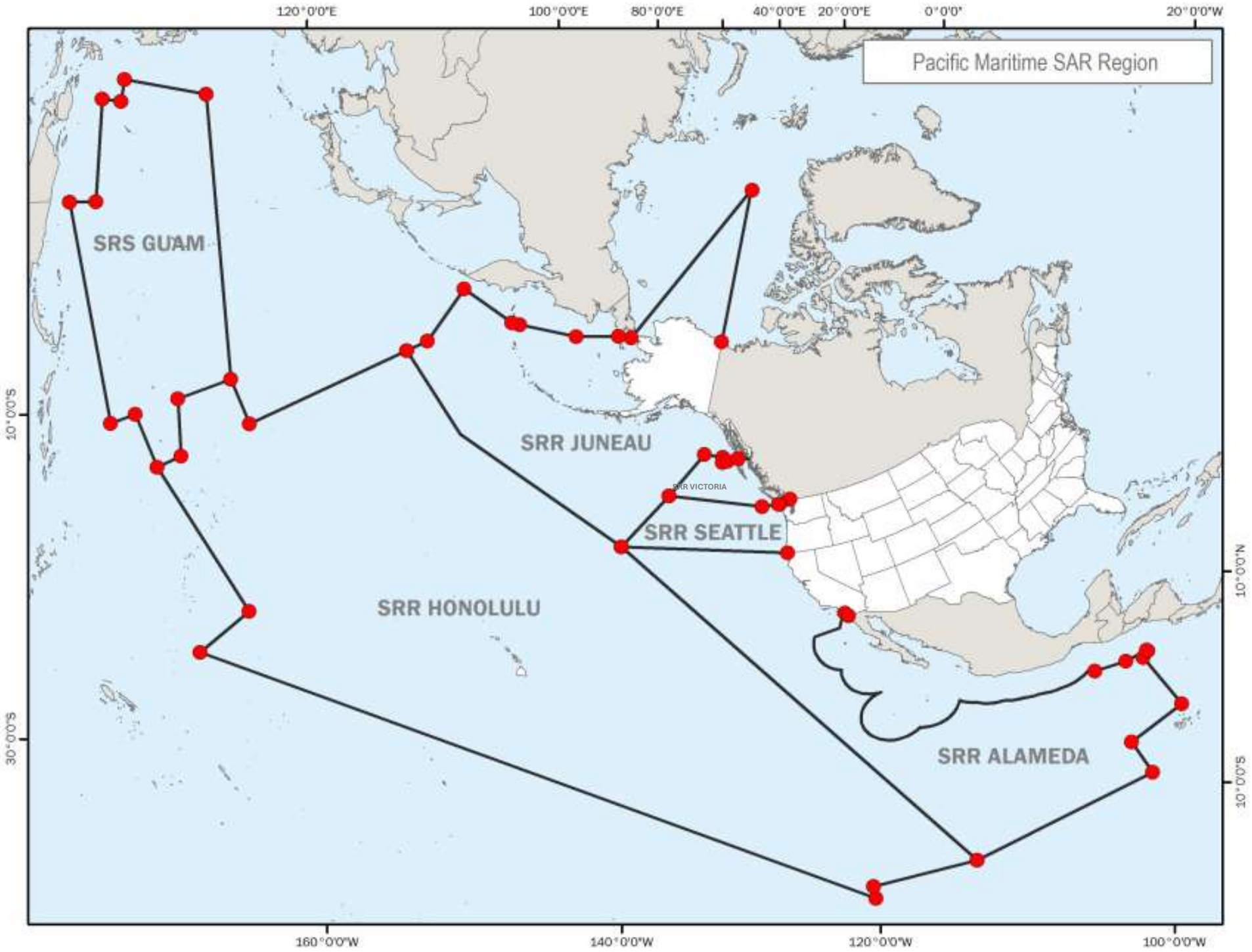


Figure B-2-16: Pacific Ocean Maritime SAR Regions

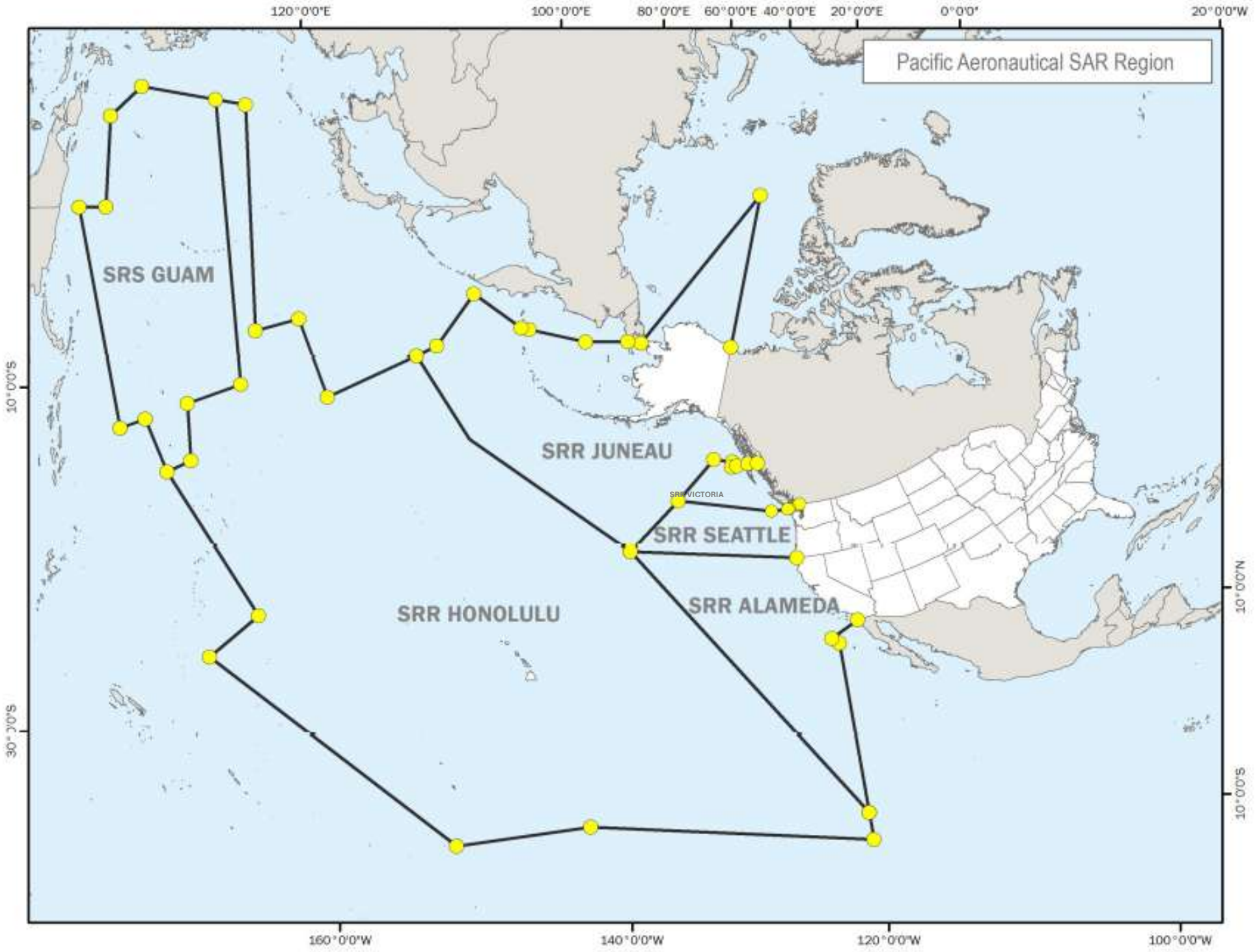
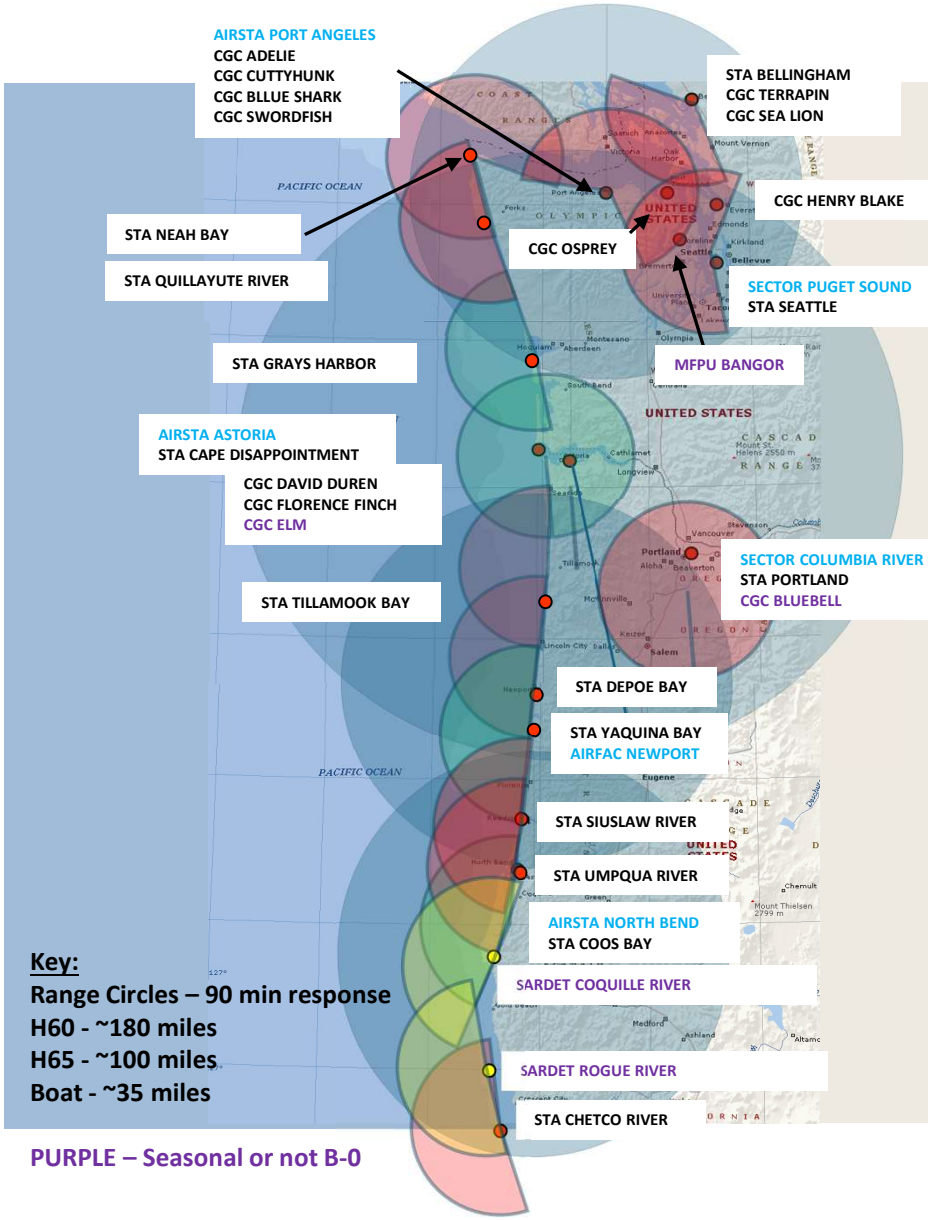
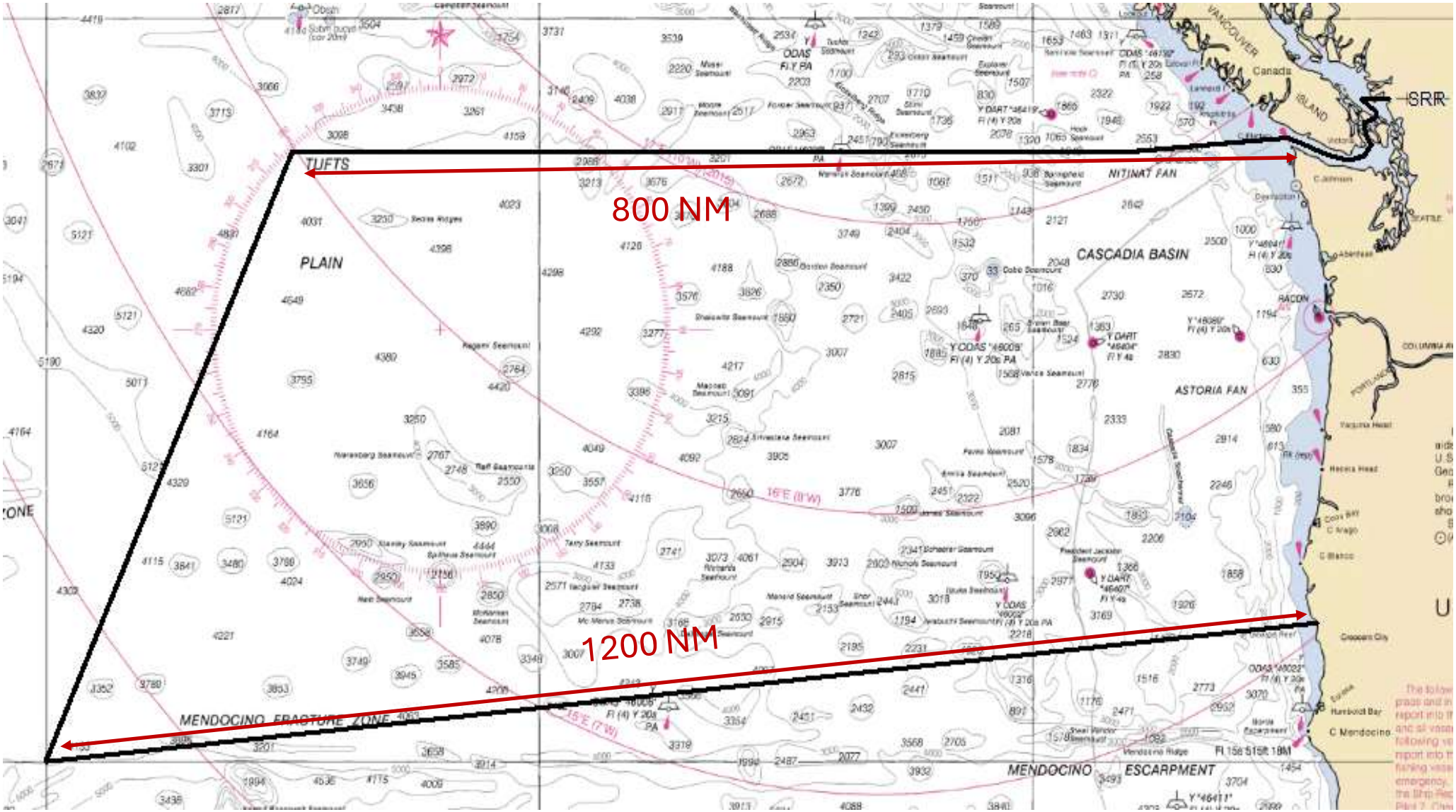


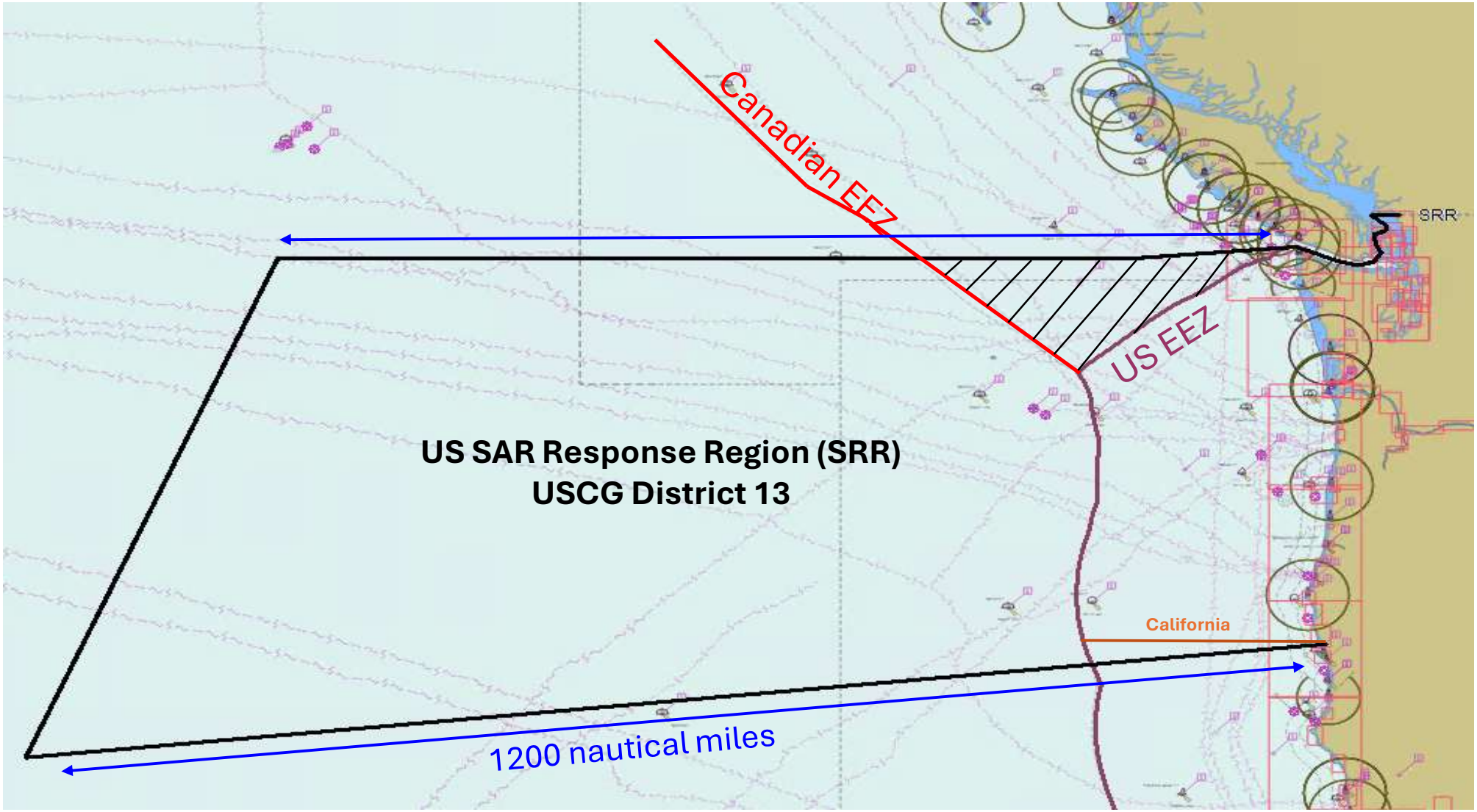
Figure B-2-15: Pacific Ocean Aeronautical SAR Regions

D13 SAR/Response Asset Laydown



US SAR Response Region (SRR)
USCG District 13




Canadian EEZ
US EEZ
SRR
US SAR Response Region (SRR)
USCG District 13
California
1200 nautical miles