

Appendix D: Estimated Line Marking Costs and Analysis

CDFW considered a multitude of factors when developing a timeline for full implementation of line marking. These included direct cost to the fleet, time required for members of the fleet to incorporate the new line marking scheme, potential manufacturing challenges, and coordination and alignment with Oregon and Washington. Please see the bottom of this appendix for gear marking present in other fisheries and various terms and definitions.

F.1 Minimum Cost Estimate:

To remain in compliance with the proposed line marking strategy the fleet will need to incur considerable costs. To estimate the minimum total cost to the fleet when transitioning to manufactured line CDFW considered number of traps allowed per permit tier, number of active permits, number of coils needed per vessel, and cost of line at the time of writing (Table F-1).

Table F-1. Table showing estimated cost of manufactured line. Active permits were permits that made one landing during the 23-24 season. Line estimates were based on personal communication with Englund Marine on July 17, 2024 (Table F-2).

Fishing Tier	Number of Traps per Tier	Number of permits/Active Permits	Number of coils per vessel	Low end vessel cost (\$226 per coil)	High end vessel cost (\$335 per coil)	Total per tier (low end)	Total per tier (high end)
1	500	48	50	\$11,300	\$16,750	\$542,400	\$804,000
2	450	46	45	\$10,170	\$15,075	\$467,820	\$693,450
3	400	47	40	\$9,040	\$13,400	\$424,880	\$629,800
4	350	47	35	\$7,910	\$11,725	\$371,770	\$551,075
5	300	39	30	\$6,780	\$10,050	\$264,420	\$391,950
6	250	89	25	\$5,650	\$8,375	\$502,850	\$745,375
7	175	46	18	\$4,068	\$6,030	\$187,128	\$277,380
Totals		NA		NA	NA	\$2,761,268	\$4,093,030

Active permits were considered to be permits that made at least one landing during the permit season, CDFW used active permits from the 22-23 fishing season for this analysis. Number of coils per vessel was calculated by dividing the number of traps per tier by 10 (10 traps per coil, see rationale below). As of the time of writing, the lowest cost of neutral line from Englund Marine was \$226.50 and the highest cost of line was \$334.20 per coil (Table F-2). To create low and high end cost estimates CDFW multiplied the cost per coil and the number of coils per vessel (Table F-1). CDFW then multiplied the cost per vessel by the number of active permits to determine an estimate cost per

fishing tier. Adding up the total cost per fishing tier resulted in a total cost between \$2.7 million and \$4.0 million for the entire fleet (Table F-1).

$$\text{Total cost per Tier} = \text{Coils per vessel} \times \text{Cost of line}$$

To calculate the number of coils needed per vessel CDFW assumed that a coil is made of 200 fathoms of line. Fishers would need to mark 15 fathoms of vertical line and between 4-6 fathoms for surface gear. Assuming an average of 5 fathoms of line used for surface gear, each fisher would need a total of 20 fathoms of marked line per trap. Therefore, a 200-fathom coil would yield 10 traps worth of marked line. CDFW then took the number of traps allowed per tier and divided it by 10 to determine the number of coils needed per vessel.

$$\text{Traps per Tier} \div 10 = \text{Number of coils needed per vessel}$$

Table F-2. Cost of proposed California commercial Dungeness crab line as quoted by Englund Marine on July 17, 2024. Prices may vary over time.

Brand of line	Line width (Inches)	Type of line	Price per coil
HydroPro	1/2	Neutral	\$334.20
HydroPro	3/8	Neutral	\$226.50
HydroPro	7/16	Neutral	\$277.00

To help offset costs to the fleet CDFW has pursued external funding to purchase marked line. An initial round of funding from OPC resulted in \$100,000 to purchase 650 coils of marked floating line. Furthermore, OPC has approved an additional \$1 million to purchase line for the fleet by summer of 2025. CDFW estimates that the additional funds will cover between 24-36% of the cost needed for the fleet to implement the proposed line marking scheme. Therefore, the final anticipated cost to the fleet is estimated to be between \$1.67 million and \$3 million.

Additionally, as an alternative to purchasing manufactured line, the proposed regulations will allow fishers to paint their line. Painted lines must be an alternating color of purple and black and the mark must be 6-12 inches in length and cover the entirety (circumference) of the line. Painted lines shall be regularly serviced and maintained. The marked line will include the surface gear and the vertical line requirements consistent with those described in Section 4.5

To estimate cost of painting line CDFW considered the cost of paint, amount of paint needed per coil, and the estimated time required to paint the line. Initial scoping with the fleet indicated that oil-based paint costs \$60-80 per gallon, and that 2-3 coils could be painted per gallon. CDFW determined a minimum of 12,218 coils would be needed by the fleet by determining the number of active permits multiplied by the number of coils needed per vessel. By taking the number of coils needed by the fleet and dividing it by the number of coils that could be painted per gallon (2.5), CDFW estimates that the fleet would require 4,887 gallons of paint. Assuming an average paint cost of \$70 a

gallon, this results in a required cost to the fleet of \$342,104 to purchase materials to paint their line.

While the cost of painting is less expensive than purchasing manufactured line, CDFW anticipates significant time and labor costs associated with painting. Initial discussions with the fleet have indicated that purchasing manufactured line would be the preferred alternative.

F.2 Other considerations:

In addition to accounting for the overall monetary cost to the fleet, CDFW also considered the practical aspect of requiring the fleet to implement line marking. Scoping with the fleet indicated that line is typically replaced on an as needed basis, and full replacement of all line would happen roughly every ten years. Allowing a phased implementation period of surface gear only, and then vertical line, allows businesses to replace existing line with marked line as existing line wears out from use and spread the cost of compliance throughout several fishing seasons. For this reason, CDFW recommends major line marking compliance deadlines of November 2025-2028. This allows fishermen to integrate the updated line marking requirements into their existing workflow of replacing and preparing line after the conclusion of the spring fishing season and prior to the beginning of the fall fishing season.

CDFW recognizes that the cost of fishing operations has increased in recent years with rising costs of fuel and crew wages. Many members of the Dungeness crab fleet participate in other fisheries throughout the year. Given the recent fishery closures in the salmon and groundfish fisheries, Dungeness crab fisherman may be experiencing heightened economic hardship. Given the increased economic burden to the fleet, CDFW recommends allowing three years to fully implement all aspects of the proposed line marking scheme.

F.3 Manufacturing Constraints:

CDFW additionally considered manufacturing requirements and potential challenges of implementing the proposed line marking scheme. Discussion with the line manufacturer, Englund Marine, indicated an estimate of 5-6 months to manufacture and ship roughly 10,000 coils of the proposed line (personal communication, Sheila Garber, Englund Marine, July 17, 2024). With California requesting a minimum estimate of 12,218 coils of line, the time of production would be between 6-7 months.

In addition to California state line marking efforts, the Pacific Fishery Management Council (PFMC) has adopted a line marking strategy that requires a transition to manufactured multi-colored line in multiple fixed gear groundfish fisheries. Within the 3-year transition period established by PFMC many coils of line will be required to outfit the currently active vessels which could add further manufacturing delays or changes to cost (<https://www.pcouncil.org/actions/fixed-gear-marking-and-entanglement-risk-reduction> accessed July 1, 2024).

The amount of time needed to produce line could increase with new line marking requirements in the federal groundfish fisheries, and similar line marking efforts in Oregon and Washington. Therefore, when considering the potential manufacturing challenges of producing line for multiple fisheries and states, CDFW believes that the proposed strategy allows enough time to sufficiently address manufacturing pinch points while balancing a need for increased entanglement monitoring.

F.4 Gear Marking in other Fisheries:

Recognizing the importance of reducing the proportion of entanglements in unidentified fishing gear, the California Legislature, FGC, and CDFW have advanced proposals to enhance gear marking requirements for multiple fisheries operating within the Plan Area. Updates to Fish & G. Code § 9005 in 2018 required CDFW to adopt regulations requiring standardized gear marking in state-managed commercial trap fisheries by January 1, 2020. CDFW undertook a rulemaking process to adopt Cal. Code Regs., Tit. 14 § 180.5 to establish a standardized framework for marking commercial fishing gear used in the spiny lobster, rock crab, tanner crab, spot prawn, coonstripe shrimp, and nearshore finfish fisheries. The updated regulations:

- require each buoy to be marked with a fishery-specific identification letter (see Table F-3) multiple times depending on the size of the buoy
- require at least one buoy marking a given trap, or string of traps, to be marked by a specified identification number (see Table F-3)
- prescribe minimum height and thickness of the identification letters
- specify where markings must be present
- specify markings must be in a color that contrasts with the buoy and maintained so they are visible and legible

Table F-3. Specified identification letters and numbers for state-managed commercial trap fisheries, as defined in Cal. Code Regs., Tit. 14 § 180.5.

Fishery and Gear Type	Identification Letter	Identification Number
Lobster Trap	P	operator's commercial fishing license identification number
Rock Crab Trap	X	operator's commercial fishing license identification number
Tanner Crab Trap	T	vessel's commercial boat registration number
Spot Prawn Trap	S	operator's commercial fishing license identification number
Coonstripe Shrimp Trap	C	operator's commercial fishing license identification number
Nearshore Finfish Trap	Z	operator's commercial fishing license identification number

The regulations were effective as of October 28, 2019, with a compliance date of May 1, 2020.

In December 2020, the FGC adopted updated regulations governing activities of the recreational crab fishery which were effective as of November 1, 2021. Among other changes, the updated regulations:

- require each crab trap to be marked only with a main buoy and a marker buoy
- specify minimum sizes for main buoys
- specify a required color and minimum size for marker buoys
- specify a maximum distance between the main and marker buoys

In addition, CDFW formalized a previously ad-hoc approach to conducting follow up interviews with California-permitted fishermen whose gear is involved in marine life entanglements. When buoy markings indicate the gear may have originated from a California fishery and traced back to an individual, CDFW searches license and permitting records for vessel, permit, or fishermen identification numbers documented on entangling gear. If this search indicates California-permitted gear was responsible for the entanglement, CDFW conducts a follow up interview with the permitted individual to learn about gear set location, gear configuration, last known servicing and any other relevant information that will support entanglement response and forensic review by sharing these findings with NMFS.

F.5 Terms/Definitions:

Coil: Sometimes called a "spool", a coil is a standard unit of line purchased from a manufacturer. Coils are then cut to smaller sizes (shots) based on the needs of the fishermen. A standard coil is 200 fathoms of line but may vary from manufacturer to manufacturer.

Shot: A fixed length of line used by fishermen, typically 5, 10, 15, or 20 fathoms in length. Different shot lengths are strung together by fishermen to accommodate the depth at which they are fishing.

Note: fishermen typically have more line than strictly necessary per trap to help accommodate different fishing depths. Fishermen may have between 2-3 times the amount of line needed, broken out into varying shot lengths.