3.6 COMMERCIAL AND RECREATIONAL FISHERIES

The Environmental Impact Statement (EIS) analysis area for commercial and recreational fisheries is limited to river systems hydrologically connected to the project that contribute to the Bristol Bay salmon fishery, to recreational fisheries in connected river and lake systems, and to the Cook Inlet saltwater environment. The EIS analysis area includes the Alaska Department of Fish and Game (ADF&G) commercial registration Area T and Area H, the Cook Inlet Management Area (including associated federal waters), and the ADF&G Statewide Harvest Survey (SWHS) areas S, T, N, and P. The EIS analysis area also covers the Area H Cook Inlet Salmon Fishery and the groundfish and shellfish fisheries of the Cook Inlet Management Area.

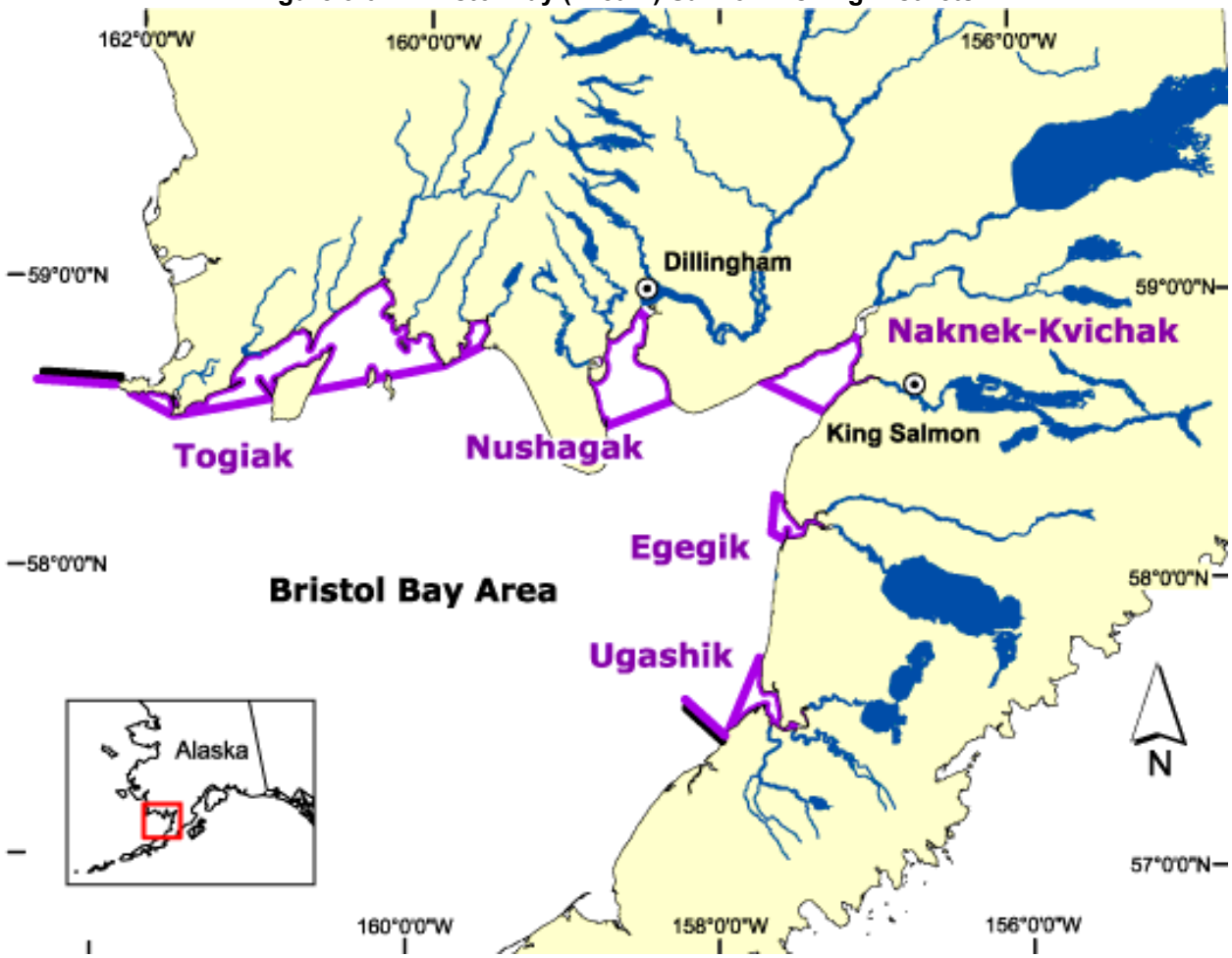
3.6.1 Bristol Bay Commercial Fishery

The inshore waters of Bristol Bay are home to the world's largest sockeye fishery and some of the world's largest natural salmon runs. Between 2000 and 2010, Bristol Bay provided 45 percent of the world's sockeye harvest, 7 percent of the world's wild salmon harvests, and 2 percent of world salmon supply (EPA 2014). Between 2011 and 2016, Bristol Bay provided between 4 and 11 percent of all wild salmonid harvests and between 1.1 and 2.3 percent of world salmon supply (FAO 2018). Each year, roughly 2,840 holders of State of Alaska Area T salmon permits (Figure 3.6-1) have the opportunity to harvest salmon from five major fishing districts managed by the ADF&G.[1] Bristol Bay's economic ecosystem is driven by the annual return of salmon to the region. Average monthly employment in June, July, and August can be more than double that of the winter months, and the salmon harvest generates 60 percent of regional self-employment income (Abrahamson 2011). The regional Comprehensive Economic Development Plan for the Bristol Bay Region (excluding the Bristol Bay Borough) prioritizes the health of the Bristol Bay salmon fishery as a key economic and cultural driver (BBNA 2019).

In comparison to the inshore state waters salmon fishery, fisheries outside of the 3-mile limit of state waters are limited by the federally managed Nearshore Bristol Bay Trawl Closure Area. The closure area bans trawl fishing in federal Bristol Bay waters, with the exception of the seasonal opening of a very small area west of Cape Constantine and Nushagak Point. With localized federal conservation measures in place to protect juvenile red king crab, the Area T Bristol Bay salmon fishery is the only commercial fishery in the Bristol Bay portion of the EIS analysis area.

[1] In Alaska, commercial fishing salmon permits are issued by the State and can be used in one specific fishery as defined by state regulations. The State assigns each fishery a letter designation. The designation for Bristol Bay is "Area T."

Figure 3.6-1: Bristol Bay (Area T) Salmon Fishing Districts



Source: ADF&G 2018k

3.6.1.1 The Bristol Bay Salmon Fishery

The Area T Bristol Bay salmon fishery (the fishery) is divided into five districts (Naknek/Kvichak, Egegik, Ugashik, Nushagak, and Togiak) encompassing nine major river systems. Only the Kvichak drainage in the Naknek/Kvichak district and the Nushagak/Mulchatna drainage (via the Mulchatna) in the Nushagak district are hydrologically connected to the project. Across all five districts, sockeye salmon (*Oncorhynchus nerka*) is the most commonly harvested species, representing 94.8 percent of all salmon harvested from 2000 through 2019. In the Naknek/Kvichak district, the Egegik district, and the Ugashik district, sockeye salmon represented 97.5 percent or more of the harvest (see Appendix K3.6, Table K3.6-1). In the Nushagak district, sockeye represent nearly 90 percent of the 20-year (2000 through 2019) harvest, with chum salmon (*O. keta*) and pink salmon (*O. gorbushca*) representing 6.8 percent and nearly 2.5 percent of the harvest, respectively.[2] Although Chinook salmon (*O. tshawwytscha*) accounted for less than one-half a percent of annual Nushagak harvest over the last 20 years, the number of fish harvested averages nearly 35,000 fish annually, making the Nushagak district the most important Chinook salmon fishery, by volume, outside of Southeast Alaska (ADF&G 2018k). The Togiak district also harvests sizeable portions of chum salmon and pink salmon, with those

[2] Unless otherwise stated, 20-year average and 20-year retrospective data refer to the 2000-2019 fishing seasons.

species accounting for 19.3 percent and 4.3 percent of the 20-year harvest, respectively. Over the last 20 fishing seasons (2000 through 2019), the fishery's average annual harvests were 27 million sockeye salmon, 1.1 million chum salmon, 257,000 pink salmon, 96,000 coho salmon (*O. kisutch*), and 40,000 Chinook salmon (ADF&G 2020).

Harvest varies significantly across the five fishing districts and in each district from year to year. On average, the most productive fishing districts are the Nushagak district (8.8 million total salmon/7.9 million sockeye annually) and Naknek/Kvichak district (8.6 million total/8.4 million sockeye), followed by the Egegik (7.3 million total/7.2 million sockeye), the Ugashik (2.9 million total/~2.9 million sockeye), and the Togiak (0.8 million total/0.6 million sockeye). Harvest size in each district can vary substantially due to differing productivity of the river systems, which are encompassed by each district and the natural year-to-year variation in the number of returning fish (also referred to as a run). Under the direction of the Alaska Board of Fish, which helps establish regulations and management practices, the ADF&G manages each district to ensure that the required number of salmon reach their spawning grounds to maximize long-term productivity. This management includes significant investment in the understanding of the long-term productivity of Bristol Bay's fishery resources through efforts such as genetic testing and other biological research, management plans to provide regulatory structure across a variety of productivity scenarios, in-season management of the fishery, post-season summarization and analysis of each year's fishery, and pre-season estimation of the upcoming year's fishery.

The number of salmon that are not harvested by the fishery is known as the "escapement number." Harvest numbers tend to vary more than escapement numbers because the escapement goal is a set range, while fishing effort is the tool used to balance between the number of fish returning and the escapement goal. In particular, the Naknek/Kvichak district is known for its varying run strength for sockeye. The 20-year minimum harvest in this district was 1.4 million sockeye, compared to an average of more than 8.4 million and a maximum of 16.5 million. The largest harvest was nearly 11.6 times the smallest harvest. In the Nushagak district, which is also connected to the project area by surface waters, the largest harvest of 24.2 million sockeye was 9.1 times larger than the smallest harvest of 2.7 million. The smaller districts (by harvest) can be highly variable as well; in the Ugashik district, which is not connected to the project area via surface waters, the largest harvest was nearly 14 times the smallest harvest. Across the entire Bay, the average largest sockeye harvest was four times the smallest harvest between 2000 and 2019. In all districts, the average harvests from 2010 to 2019 have been larger than the average harvests from 2000 to 2009. Across the entire Bay, sockeye salmon harvests have average 38 percent higher for the latest 10 years compared to the preceding 10 years. These higher harvests may be due in part to changes in management and escapement goals resulting from research completed in 2012. The ADF&G periodically reviews escapement goals to ensure that, to the extent possible, fisheries are managed for maximum sustained yield (Fair et al. 2012). Harvests by district are shown in Table K3.6-2 in Appendix K3.6.

The 20-year average sockeye escapements for each of the districts are 6.8 million sockeye in the Naknek/Kvichak district (which contains two major river systems), 3.3 million sockeye in the Nushagak district, 1.4 million sockeye in the Egegik district, 1.1 million sockeye in the Ugashik district, and 0.25 million sockeye in the Togiak district (see Table K3.6-3 in Appendix K3.6). In all districts, average escapement was higher from 2010 to 2019 than from 2000 to 2009. Fish that "escape" the commercial fishery are then a source for harvest opportunities for freshwater subsistence and recreational users.

Administration of the Bristol Bay fishery occurs through two different sets of permits: drift net permits and set net permits. Drift nets are attached by one end to boats and set nets are attached to land. On average, drift net permit holders harvest four out of every five fish harvested in the fishery, but the ratio has been as low as two out of every three fish (Table 3.6-1). Drift net permit

holders are able to move from district to district during and between fishing seasons to adjust to changing run strength (i.e., the number of returning fish) and timings. Set net permit holders hold long-term tenure to selected fishing sites, which are registered with the State of Alaska, are often handed down from generation to generation, and generally cannot change sites without identifying a new site in another watershed and moving their operations. In the event of lost productivity in a specific watershed, the set net permit holders with sites at the mouth of that watershed would experience a disproportionate level of economic harm. At the same time, drift net permit holders, who have mobility in where they fish, can mitigate changes in individual watershed productivity by moving their operations. Set net permit holders in other watersheds would not experience harm if the productivity in their watersheds did not change and the overall price for salmon in the fishery did not change.

Table 3.6-1: Sockeye Drift Net and Set Net Harvest Split (Percent)

	20-Year Min.	20-Year Max.	20-Year Median	20-Year Average	2000-2009 Average	2010-19 Average
Drift Net Portion	66	85	81	80	79	80
Set Net Portion	15	34	19	20	21	20

Note: The maximums and minimums do not add to 100 because the maximum percentage year for drift nets is the minimum for set nets, and the maximum for set nets is the minimum for drift nets.

Source: ADF&G 2020

3.6.1.2 Nushagak and Kvichak District Historical Harvest and Escapement

As previously discussed, the EIS analysis area is limited to river systems hydrologically connected to the project area, which contribute to the Bristol Bay salmon fishery. Only the Naknek/Kvichak district and the Nushagak district contain rivers that are hydrologically connected to the project area.

The Naknek/Kvichak district contains three of the nine major river systems in the Bristol Bay fishery, but only the Kvichak River is hydrologically connected to the project area. Over the last 20 years, the river contributed 14 percent of the average annual inshore sockeye salmon return (i.e., harvest plus escapement) to Bristol Bay and 39 percent of the total average annual inshore returns for the district (see Table K3.6-4 and Figure K3.6-1 in Appendix K3.6). The Kvichak River is known for its variable sockeye salmon return strength; the smallest return to this river in the last 20 years was 707,000 fish, and the largest number of returning fish was 15.5 million. At the same time, the average sockeye salmon return to the river system from 2010 to 2019 was more than double the average return from 2000 to 2009 (ADF&G 2020).

The Nushagak district is also composed of three large river systems: the Wood River, the Igushik River, and the Nushagak River. The Nushagak River is hydrologically connected to the project via the Mulchatna River system, but the other two river systems are not. The Wood River, fed by the Wood-Tikchik Lake system, is the dominant sockeye salmon producer in the district and accounted for 62 percent of estimated sockeye returns over the last 20 years. The return to this system averaged slightly more than 7 million fish per year between 2000 and 2019. In comparison, the Nushagak River accounted for more than 2.9 million sockeye salmon per year from 2000 to 2019, or 25 percent of the district total. The Nushagak River experiences significant variations in number of returning salmon. Although not as extreme as the variations found on the Kvichak and Alagnak rivers, the largest number of returning fish in the past 20 years was nearly 14 times the size of the smallest return (see Table K3.6-5 and Figure K3.6-2 in Appendix K3.6).

In the context of other Bristol Bay rivers and other Alaska rivers such as the Kenai River and the Copper River, the Nushagak River is of lesser magnitude in the average number of returning sockeye salmon and the Wood River is the dominant producer of sockeye in Nushagak district. Both rivers can have extraordinary years where productivity surges. For example, in 2018 the total number of returning sockeye salmon in the Wood River was 22.4 million and the total run in the Nushagak River's was 8.2 million. Both numbers are four times greater than the typical averages for both rivers. Where the Nushagak River and its tributary, the Mulchatna River, truly stand out is the average number of returning Chinook salmon. From 2000 to 2019, the entire Bristol Bay commercial fishery harvested an average of 40,246 Chinook each year; 34,290 of these fish (87 percent) were harvested in the Nushagak district. By comparison, the average annual harvest from the Naknek-Kvichak district is slightly more than 1,727 fish for the same time period. The 20-year average number of returning Chinook for the Nushagak is nearly 161,000 (ADF&G 2020), which makes the Nushagak system one of the most productive for Chinook salmon in Alaska.[3] The average numbers of returning Chinook in other river systems in Alaska are approximately 260,000 in the Kuskokwim drainage, 166,000 in the Yukon drainage, 100,000 to 200,000 in the Susitna drainage, 56,000 in the Kenai River, and 55,000 in the Copper River (JTC 2018; Poetter and Tiernan 2017; ADF&G 2008c, 2016a; Russell et al. 2017).

Annually, the Bristol Bay salmon fishery creates thousands of jobs and generates hundreds of millions of dollars in economic activity and wages. A 2013 study by the Institute for Social and Economic Research at the University of Alaska, Anchorage, found that in 2010 the industry created 12,000 seasonal jobs in Bristol Bay (equal to 2,000 annual jobs); another 1,000 jobs involved in shipping, secondary product processing, and retailing after the fish left Bristol Bay; and 6,800 in ancillary and indirect employment in industries that serve fishing and processing operations in Bristol Bay. In total, the fishery generated $1.5 billion in output value (i.e., the value of goods and services produced) and $500 million in income (Table 3.6-2).

Table 3.6-2: Bristol Bay Economic Contribution, 2010

Annual average employment: 9,800 jobs	Output value: $1.5 billion	Income: $500 million
Fishing and Processing in Bristol Bay		
12,000 seasonal jobs (= 2,000 annual jobs)	$390 million	$140 million
Shipping, secondary processing, and retailing after Bristol Bay		
1,000 jobs	$110 million	$40 million
Multiplier impacts in other industries		
6,800 jobs	$970 million	$320 million

Source: Knapp, Guettabi, and Goldsmith 2013

A more recent study for the Bristol Bay Regional Seafood Development Association (BBRSDA) found similar estimated economic contributions from 2013 to 2017, including an average of 12,500 annual jobs, annual labor income of just over $650 million, and total economic contribution of $1.2 billion (WRC 2018).

The drivers of this economic contribution are the quantity of the salmon harvest and the value of that product on the world market. Volume and real value have increased in recent years, which

[3] Chinook harvest in the Bristol Bay fishery has dropped in recent years. In comparison to the current 20-year average of 40,256 Chinook per year through 2019, the 20-year 1997 to 2016 average was 51,869 Chinook per year with 44,271 of these fish (85 percent) harvested in the Nushagak district.

along with inflation helps explain the differences between Knapp, Guettabi, and Goldsmith (2013) and WRC (2018). The average price per pound that processors pay permit holders for their salmon depends largely on the condition of world salmon markets, including salmon produced by other wild and farmed sources (Knapp 2004; McDowell Group 2014, 2015, 2016, 2017; Seeger 2015; Valderrama and Anderson 2010). Individual and collective efforts around marketing, improving product quality, and developing new markets and products can also have long-term effects on the value of salmon at the harvester level. The connection to a world commodity market means that ex-vessel prices (i.e., the price paid to the permit holder at the point of delivery) for salmon can vary markedly from year to year. In 2018, permit holders in Bristol Bay received an average of $1.62 ($US 2019) per pound for sockeye salmon, including postseason adjustments and bonuses.[4] In 2015, they received $0.64 ($US 2019) per pound on average (Figure 3.6-2). From 2010 to 2018, the average price swing from year to year was +/- 26 percent.

With the exception of 1998, when prices for sockeye were at their modern high, the prices that Bristol Bay permit holders receive for their salmon are lower than prices received for the same species of fish caught in other major Alaskan salmon fisheries. Between 1997 and 2017, the ex-vessel prices for sockeye salmon in the Cook Inlet, Copper River, Prince William Sound, and Southeast Alaska fisheries averaged 50 percent, 150 percent, 60 percent, and 54 percent higher, respectively, than the price paid for Bristol Bay sockeye (Table 3.6-3). Annual data show that the price gap tends to be smaller when demand for sockeye is higher, and tends to increase when demand for sockeye is low. The price differential can be explained as noted by McDowell Group (2014):

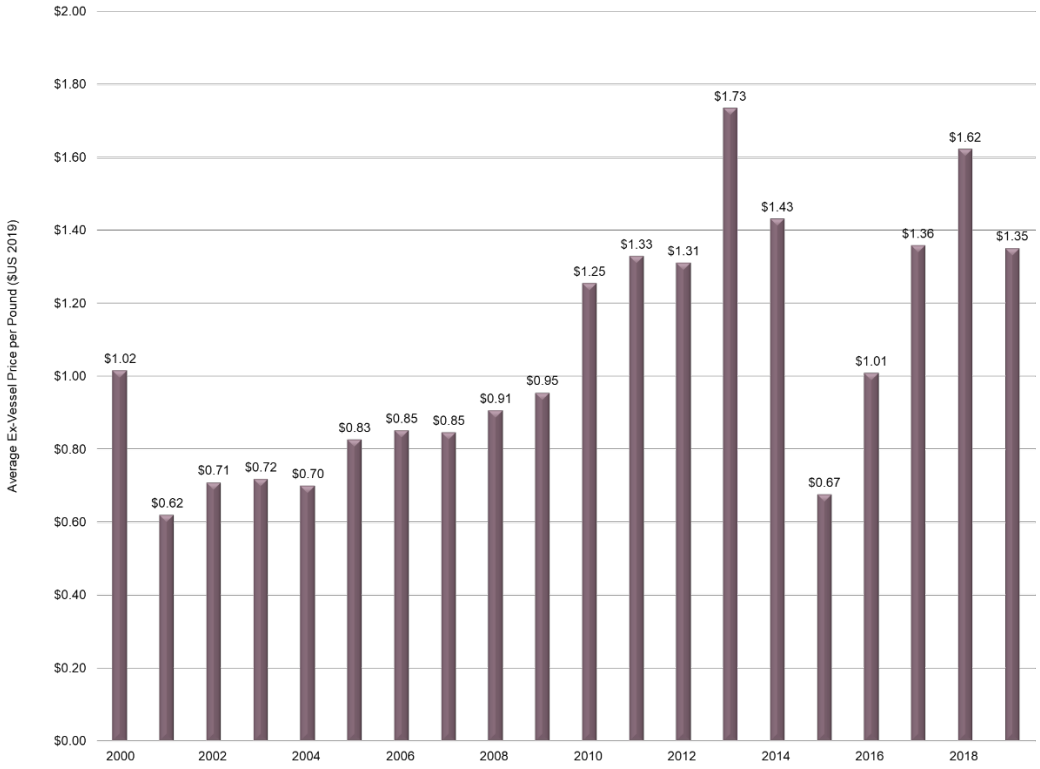
> Bristol Bay fishermen typically receive lower sockeye prices due to the fishery's remote location, intense run timing,[5] and product mix. A larger percentage of sockeye caught in Cook Inlet and Southeast is sold into fresh markets, resulting in a higher average wholesale price. Copper River is typically Alaska's first major sockeye fishery, thus yielding a higher market price.[6] Additionally, plants in other areas often have access to other species that allows them to cover fixed expenses and offer better prices to fishermen for high-value sockeye while Bristol Bay plants rely almost solely on sockeye.

[4] The average price per pound paid for sockeye salmon in 2019 *including* postseason adjustments and bonuses was not available at the time of analysis. The average prices paid in 2019 *excluding* postseason adjustments and bonuses was $1.35 per pound.

[5] Intense run timing refers to the fact that in Bristol Bay a large number of fish return to the bay in a very short amount of time. Instead of a fishing season that lasts 2 months, fishing in Bristol Bay tends to be concentrated in a period of 2 to 3 weeks. The large volume of fish arriving at one time can limit the flexibility of processors to pursue the highest value products. Processors are forced to consider what products can be made to process this volume of fish rather than what products should be made to maximize value. *This footnote is not part of the original quotation. Added for value to the reader.*

[6] Copper River's position as the first salmon fishery to open each year means that salmon harvested in that fishery are the first fresh, wild salmon to reach the market in 6 to 7 months. This market position contributes to Copper River's price premium. *This footnote is not part of the original quotation. Added for value to the reader.*

Figure 3.6-2: Average Price per Pound for Bristol Bay Sockeye, 2000-2019[7]



Source: ADF&G 2020

Table 3.6-3: Percentage Price Premium (Discount) for Other Alaska Sockeye Fisheries Relative to Bristol Bay, 1998-2017

	Cook Inlet	Copper River	Prince William Sound	Southeast
20-Year Min. Price	-6	-2	-9	11
20-Year Max. Price	150	316	133	105
20-Year Median Price	53	159	61	55
20-Year Average	50	150	60	54
1998-2007 Average	35	143	56	56
2008-17 Average	63	156	64	52

Source: ADF&G 2018k

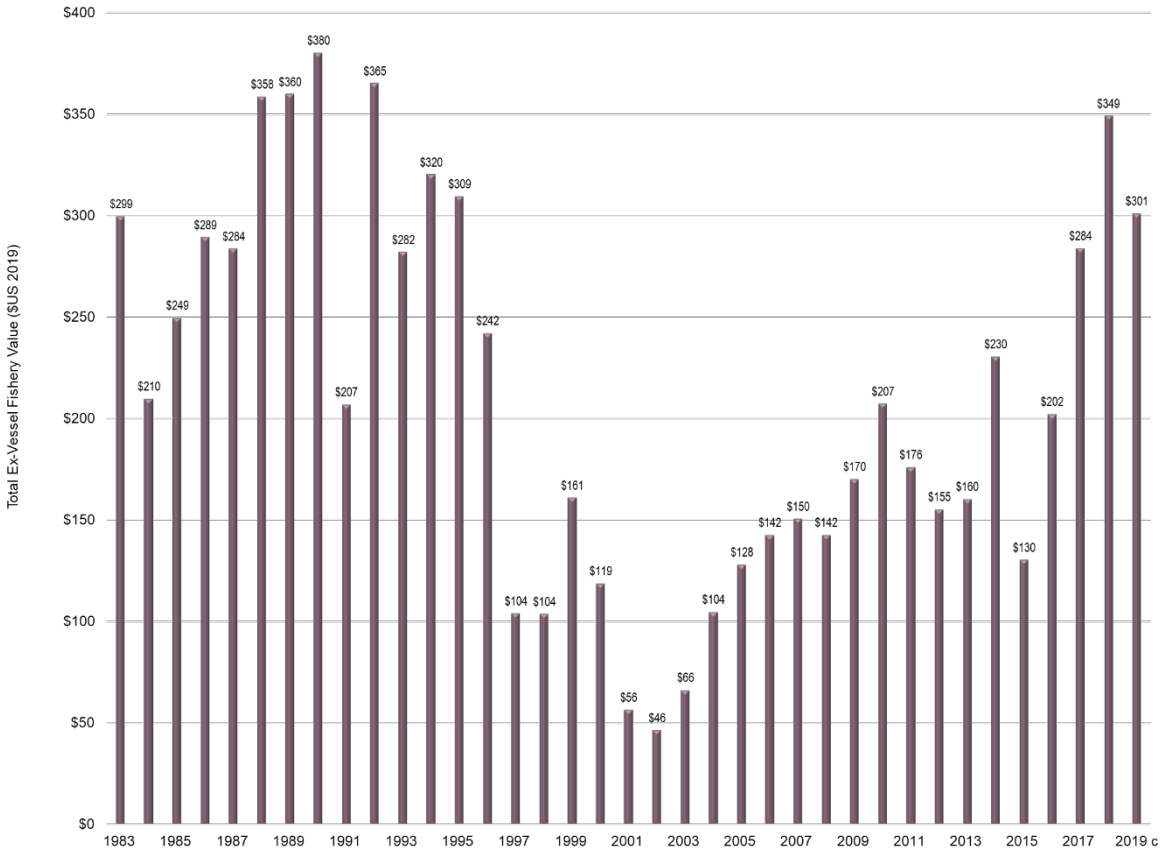
In recent years, Bristol Bay permit holders have worked with processors to increase quality throughout the chain of custody, especially through better handling practices, and to begin the process of establishing a brand identity (BBRSDA 2018a; Dischner 2016b; Hagenbuch 2016; National Fisherman 2019; McDowell Group 2015, 2016, 2017). These efforts have a goal of increasing the price and value of Bristol Bay's fish. McDowell Group (2014) documents the value of an established brand and reputation. In 2013, Copper River branded sockeye averaged $1.92 (18.8 percent) more per pound at the retail level than unbranded sockeye salmon, including Bristol Bay sockeye. The benefit of establishing a brand for Bristol Bay sockeye was noted as early as

[7] Prices for 2019 do not include post-season adjustments or bonuses.

2002 to 2003 (NEI 2003). The BBRSDA established the fishery's first cohesive brand in 2016. As then noted by the BBRSDA's communications consultant, "…and the idea is, to able to show, every link in our supply chain—retailer, processor, distributor—that when we put some effort into branding Bristol Bay sockeye, it impacts sales. And that's really hard to do when you have a commodities brand like Bristol Bay sockeye or Alaska Seafood" (Dischner 2016a). The BBRSDA's efforts focused on a localized test market (Boulder, Colorado) in 2016, but expanded to national efforts in 2017 and 2018 (BBRSDA 2018b).

In 2019, the Bristol Bay commercial salmon fishery generated $301 million ($US 2019) in ex-vessel payments to all Area T permit holders, making that year the second-best year for permit holders collectively since 2000 and the eighth best year in real (i.e., inflation-adjusted) terms since 1983 (Figure 3.6-3).[8] The 20-year inflation-adjusted ($US 2019) ex-vessel value of the fishery is approximately $166 million, but over the last 10 years the ex-vessel value has averaged roughly $219 million per year in real terms.

Figure 3.6-3: Total Ex-Vessel Fishery Value for Bristol Bay (Area T), 1983-2019 ($US 2019)



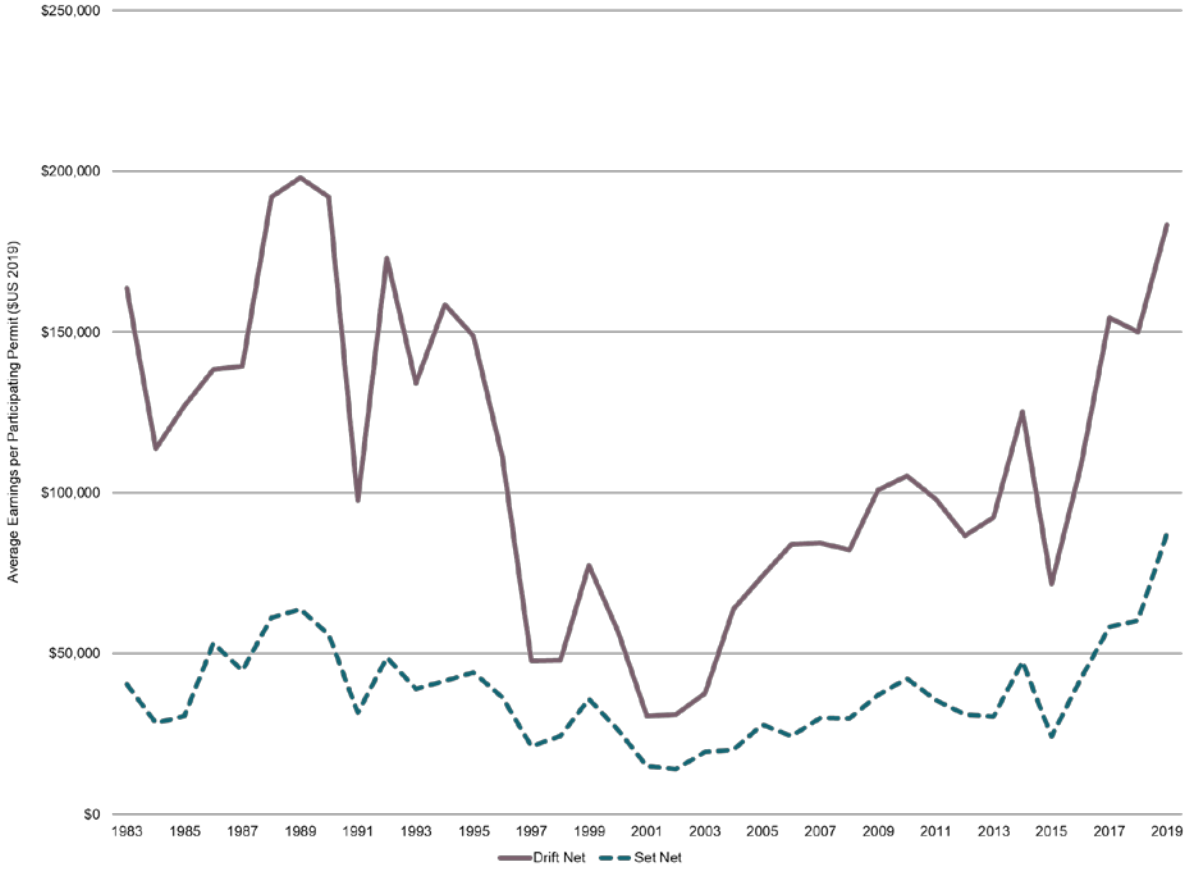
Source: ADF&G 2020

Average permit holder gross earnings vary from year to year with return and market strength but increased substantially in both the set net and drift net fisheries since 2001 and 2002, when the fishery generated the lowest level of ex-vessel value in the modern era (Figure 3.6-4). In 2019, based on preliminary numbers, drift net permits earned an average of more than $183,000, which is 66 percent higher than the average annual earnings between 1983 and 2019 and the highest annual amount since 1991. Average earnings were boosted not only by the record-setting harvest,

[8] 2019 data do not include post-season bonuses or adjustments. These data were unavailable at the time of analysis.

but by the lowest number of permits fished since 2006. Set net permits earned an average of $87,000, an amount greater than any other year between 1983 and 2019 and more than twice the average real earnings during that period of $37,900.

Figure 3.6-4: Annual Average Permit Holder Earnings per Year, 1983-2019 ($US 2019)

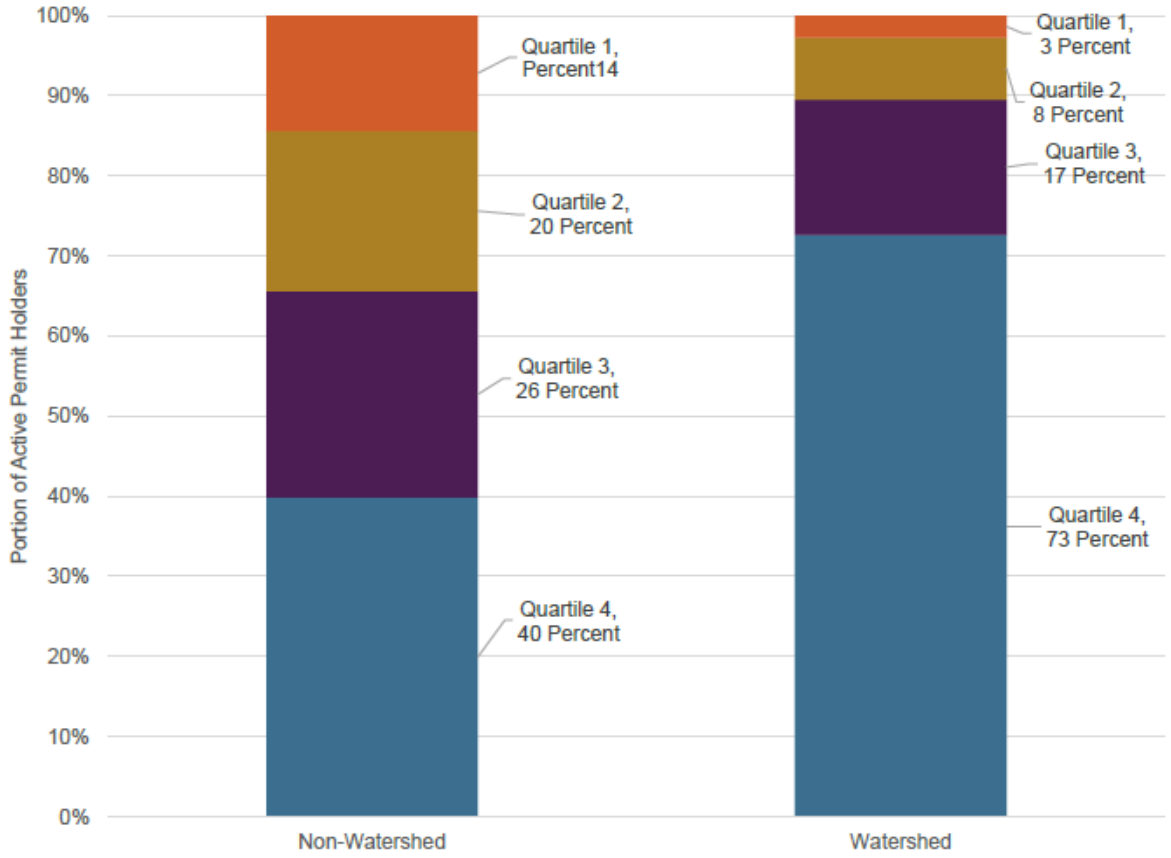


Source: CFEC 2020a

Alaska Commercial Fisheries Entry Commission (CFEC) data divide permit holders into four earnings groups (i.e., quartiles). The total amount of earnings in each group is the same, but the number of permit holders and the average earnings per permit holder is different. For example, each quartile group earned roughly $73.5 million total in 2019; however, the top group included just 154 permit holders earning an average of $477,491 each, and the bottom group included 860 permit holders earning an average of $85,495 each (CFEC 2020a). Permit holders who are residents of District T are more likely to be in the bottom quartile than are non-residents, and 80 percent less likely to be in the top quartile (Figure 3.6-5). Between 2002 and 2012, 73 percent of watershed residents were in the bottom earnings quartile, and 40 percent of non-watershed residents were in the bottom quartile.

In the same period, 3 percent of watershed resident permit holders were in the top quartile, and 14 percent of non-watershed residents earned enough to be in the top quartile (NEI 2014). These statistics may help explain permit ownership and participation trends.

Figure 3.6-5: Distribution of Quartiles in the Drift Net Fishery by Area of Residence, 2002-2012

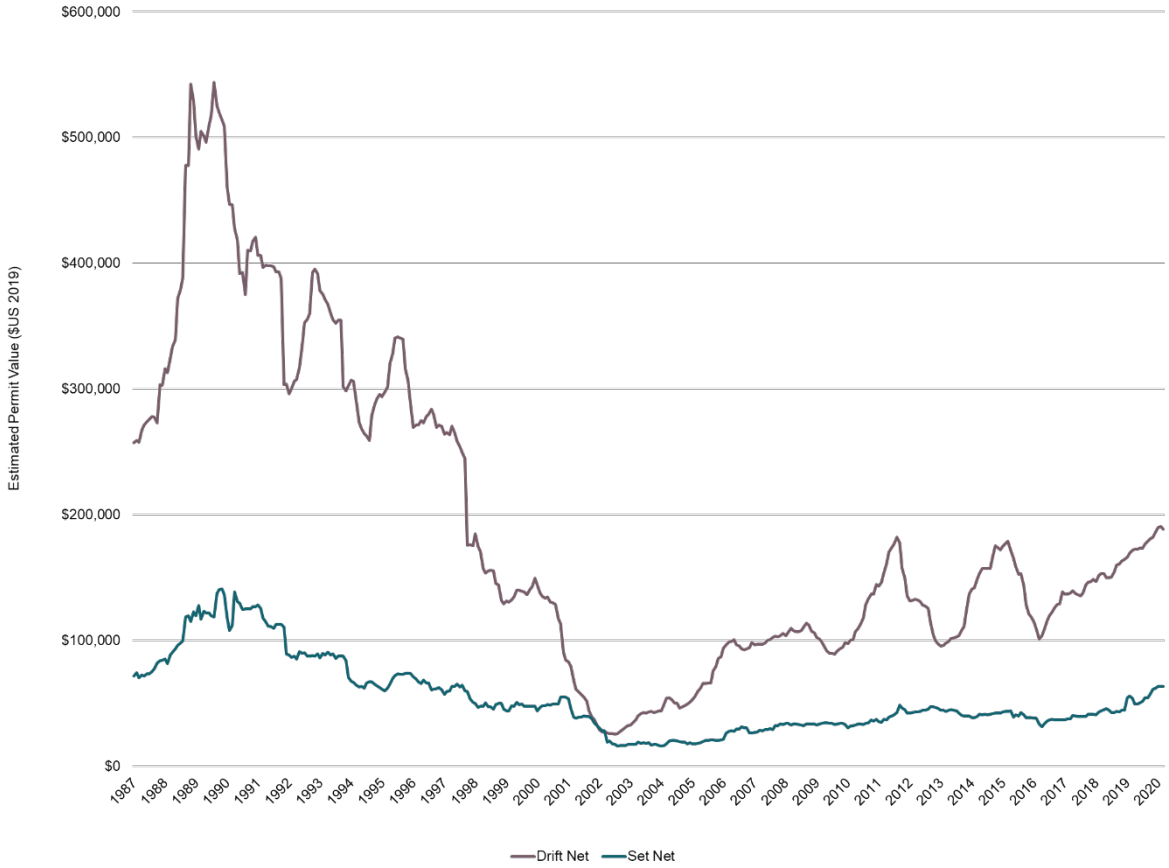


Note: Non-Watershed refers to those who live outside the watershed boundaries of Area T.
Source: NEI 2014

Participation in the fishery requires ownership of a limited-entry permit managed by the State of Alaska. Permits change hands through an open market system between willing buyers and sellers; the value of permits changes over time, particularly in relationship to expected catch volumes and per pound ex-vessel prices. Permit prices are therefore representative of expected future earnings in the fishery, and buying a permit is a business investment decision of similar magnitude to buying a home.

The CFEC estimates the March 2020 value of a drift net permit to be $188,300; set net permits are valued at $63,000 (CFEC 2020b and 2020c). The values are based on market transaction data recorded when permit holders sell and buy permits. The lower value of a set net permit reflects the lower earnings potential of these permits in the fishery. In real dollar terms, the current value of a drift net permit is nearly the highest seen since 1997, just above other recent spikes seen in March 2015 and August 2011. Drift net permit prices, and therefore CFEC estimates of value, tend to spike after exceptional runs (such as in the 2019 fishing season) when permit holders see high returns as reflective of potential future earnings. As of March 2020, set net permit prices are trading at their high point since 1996. The values of both permit types have risen steadily since the 2002/2003 low point caused by the influx of farmed salmon onto the world market. This reflects both an increase in salmon consumption and the work of some wild salmon producers to focus on their products' unique values. Inflation-adjusted values for drift net permits have increased by nearly 600 percent since 2002/2003, but they are still a third of what they were before the collapse of the Japanese economy in the late 1980s and the subsequent collapse of world salmon prices. Similarly, set net permit values are currently four times the post-1987 low, but less than half of the post-1987 high (Figure 3.6-6).

Figure 3.6-6: Real (Inflation-Adjusted) Permit Value by Permit Type, 1987-2019



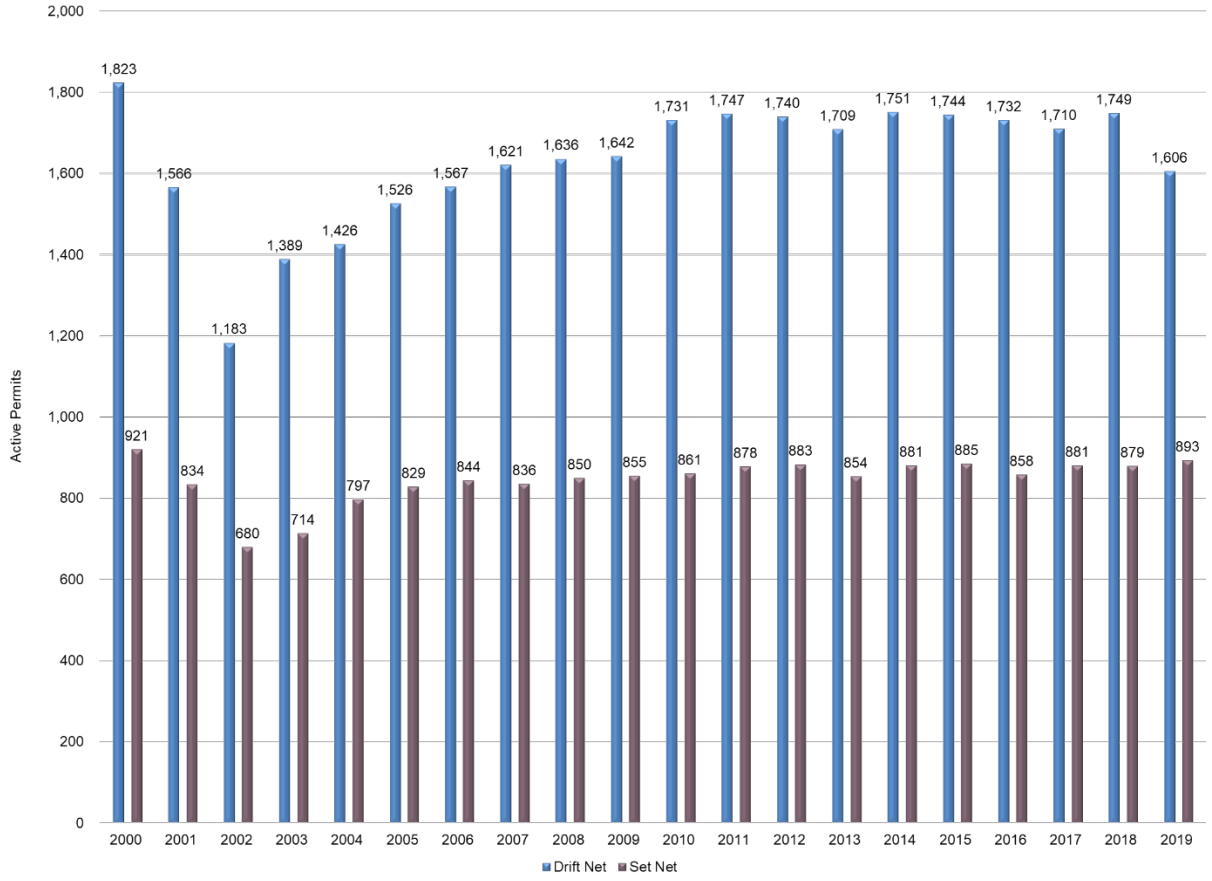
Source: CFEC 2020b, 2020c

Participation in the Fishery and Permit Ownership

Permit holder participation in the fishery varies from year to year, depending on permit holder expectations for both prices and the number of returning Bristol Bay salmon. Several distinct periods define permit holder participation over the past 20 years. Between 1997 and 2000, more than 97 percent of drift net permit holders and 90 percent of set net holders participated in the fishery. Fishery participation dropped substantially in 2001 and 2002 because low prices discouraged permit holders from fishing; only 63 percent of drift net permit holders and 67 percent of set net holders participated in the 2002 fishery. As ex-vessel prices have recovered and the fishery has become better organized with the creation of the BBRSDA and combined permit holder/processor efforts to improve the value of the fishery, a greater percentage of permit holders are fishing their permits. Between 2010 and 2018, at least 1,700 (91 percent) drift net permit holders have participated in the fishery each year. The participation rate dipped in 2019 to 86 percent, possibly because the 2019 season forecast was for a smaller harvest than 2018 (ADF&G 2018t). In the set net fishery, at least 830 (85 percent) set net permit holders have participated since 2007, and 93 percent participated in 2019 (Figure 3.6-7).

The fishery has experienced a gradual out-migration of permits from Alaskans to non-Alaskans—in particular from watershed residents (i.e., those who live in the watershed boundaries of Area T) to non-watershed Alaskans and non-Alaskans (ADF&G 2018m). Overall Alaskan permit ownership in the drift net fishery dropped from 55 percent to 46 percent between 1990 and 2019, while in the same period Alaskan ownership of set net permits fell from 76 percent to 65 percent (Table 3.6-4).

Figure 3.6-7: Annual Permit Holder Participation



Note: As limited-entry fisheries, there are a relatively fixed number of permits for the Bristol Bay drift net and set net salmon fisheries. Although there are small changes from year to year, the overall number of permits is stable. For example, from 2007 to 2017, the total number drift net permits (including active and inactive permits) in any year was no lower than 1,862 and no higher than 1,864. The number of set net permits in the same period ranged from 983 in 2007, to 972 in 2017. In recent years, it has been typical for roughly 90 percent of set net permits and 92 to 95 percent of drift net permits to remain active in the fishery by recording harvest each year. Thus, the figure above is essentially a proxy for the percentage of all permits that were active.
Source: ADF&G 2020

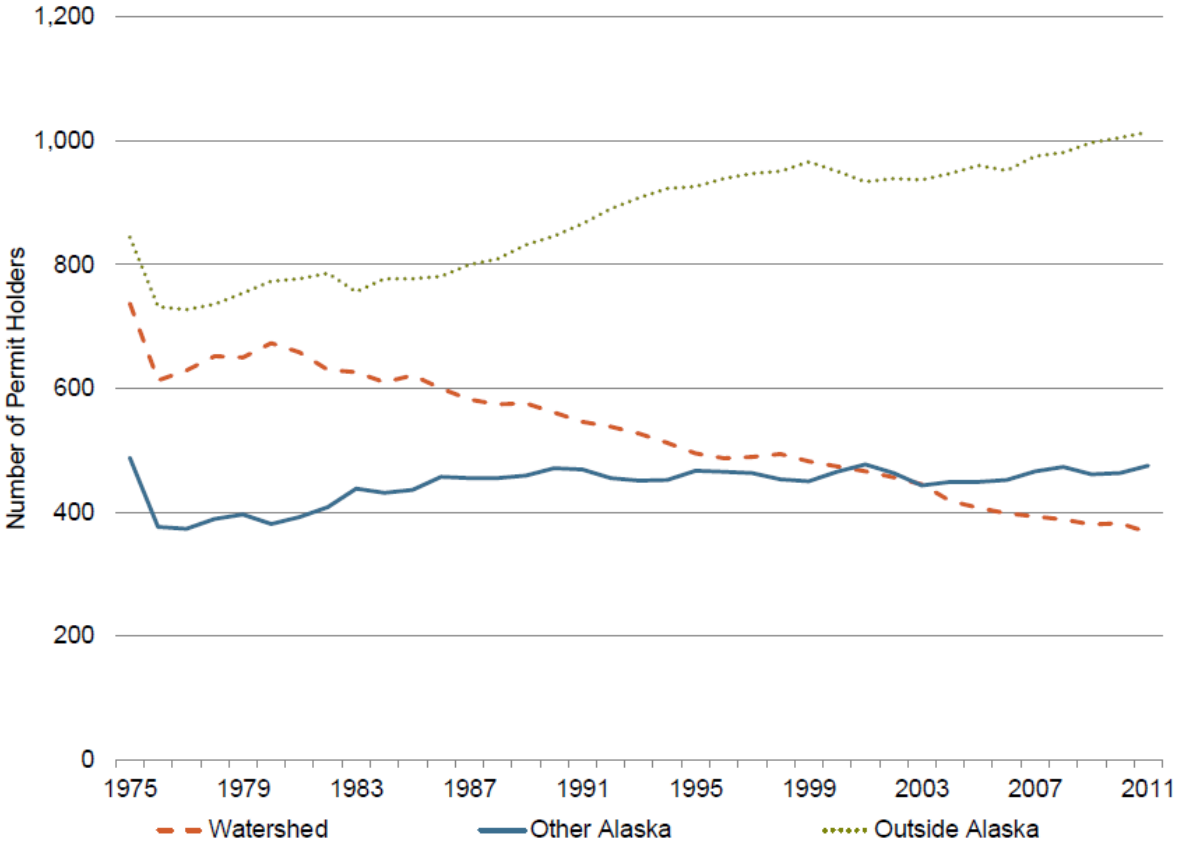
Table 3.6-4: Permits Owned by Alaskans and Non-Alaskans

Year	Drift Net			Set Net		
	Alaskan	Non-Alaskan	Percent Resident	Alaskan	Non-Alaskan	Percent Resident
1990	1,039	839	55	783	243	76
1995	967	921	51	762	257	75
2000	959	940	51	757	262	74
2005	895	967	48	688	300	70
2010	866	997	46	672	311	68
2015	834	1,030	45	639	336	66
2019	840	1,022	46	632	333	65

Source: ADF&G 2020

The collective data show a loss in Alaska-owned permits, but more refined data show that out-migration of permits is really an issue specific to the Bristol Bay watershed residents; ownership by Alaskans based outside of the watershed is stable or increasing (Figure 3.6-8). Between 1975 (when the limited-entry program started) and 2011, non-Alaskan ownership of the permits increased from roughly 850 permits to more than 1,000. Permit ownership by non-watershed Alaskans dipped after initial issuance as the CFEC adjudicated temporary permits, but has risen from a low of fewer than 400 permits to nearly 500 permits in 2011. Permit ownership by residents of the watershed fell steadily between the late 1970s and 2011, from roughly 700 permits to fewer than 400 permits. As permits leave the region, so does the associated earnings-related spending. With average permit holder earnings of more than $100,000 in 2017, the roughly 300 drift net permits that have out-migrated from the watershed between 1975 and 2011 represent approximately $30 million dollars in annual gross income that is not available to support the local economy.

Figure 3.6-8: Drift Net Participation in the Fishery by Permit Holder Region, 1975-2011



Source: NEI 2014

Theories as to why permit holders have left Bristol Bay include lower access to and higher cost of capital; the long-term effect of consistently earning less than non-watershed peers; financial hardship; population decline; and the relative desirability of joining the fishery to outsiders because of its possibly higher earning potential compared to other Alaska salmon fisheries (Apgar-Kurtz 2012). Prior research shows that Bristol Bay resident vessels tend to be older and have less horsepower, smaller fuel tanks, and less refrigeration capacity (see Table K3.6-6 in Appendix K3.6) (NEI 2009).

The rate of loss of permits is not equally spread across communities in the watershed. Apgar-Kurtz (2012) showed that the rate of permit loss was higher amongst communities that were not

part of the Bristol Bay Economic Development Corporation (BBEDC) region, despite the fact that many of these communities are eligible for BBEDC's permit loan program (BBEDC 2019). The non-BBEDC watershed communities include those that are closest to the project, including Iliamna, Nondalton, Pedro Bay, Port Alsworth, and Newhalen. The group also includes communities farther from the project but still in water systems hydrologically connected to the project, including Igiugig, Koliganek, Kokhanok, and New Stuyahok. When permit holders sell their permits, there are secondary effects on the community that lower earnings and the likelihood of community participation in the fishery:

1. There are now fewer opportunities for community members to obtain crew member jobs and bring a share of their earnings back to that community. Permit holders prefer to hire people they know, and they are more likely to know people from their own community (Apgar-Kurtz 2012).
2. People predominantly learn to fish in the region through their family; if a family sells their permits, the next generation is less likely to take part in commercial fishing (Apgar-Kurtz 2012).

It should be noted that the discussion of the geographic distribution of permit ownership is a proxy for the geographic distribution of ex-vessel earnings. The economic impact of the Bristol Bay fishery extends beyond Bristol Bay, with residents of Alaska, Washington, Oregon, and California accounting for approximately 86 percent of job holders in Bristol Bay in 2010 (see Table 3.6-5).

Table 3.6-5: Seasonal Employment In the Bristol Bay Salmon Industry by State of Residence, 2010

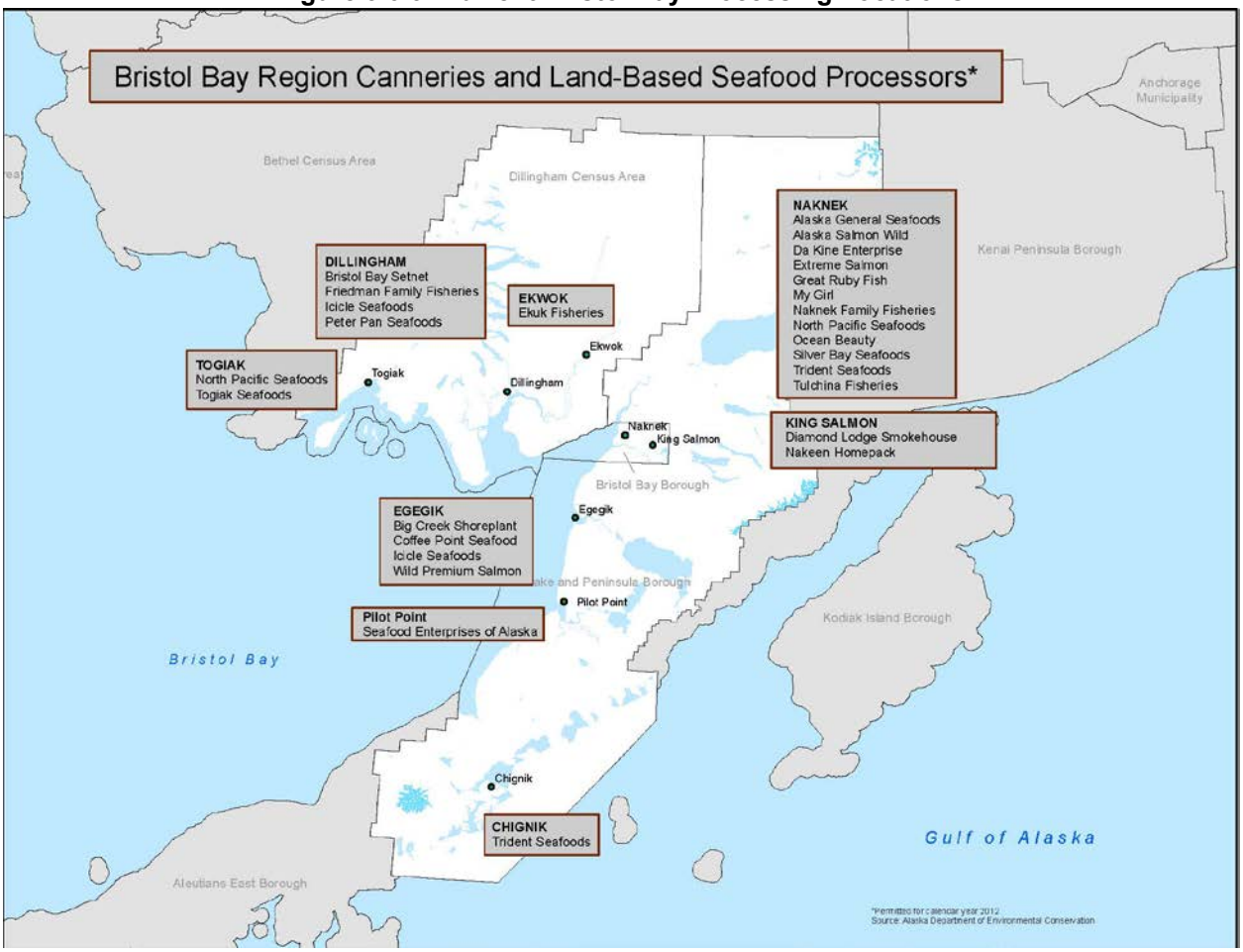
	Total US	Alaska	Washington	Oregon	California	Other States
Fishing	7,035	3,734	1,948	362	345	646
Processing	4,886	635	1,279	1,781	208	983
Total	**11,921**	**4,369**	**3,227**	**2,143**	**553**	**1,629**

Source: Knapp, Guettabi, and Goldsmith 2013

3.6.1.3 The Processing Sector

After harvest, permit holders deliver salmon to processors who pay them for their catch and prepare the fish for distribution and sale into the broader seafood market. The processing sector in Bristol Bay ranges from small family owned operations to business units of multi-national corporations with operations across Alaska, the US, and the rest of the world. Although the Alaska Department of Environmental Conservation (ADEC) documents processing facilities in seven Bristol Bay communities, the heart of processing in Bristol Bay is in the Bristol Bay Borough community of Naknek (Figure 3.6-9). In 2015, the last year for which data are available, the processing sector employed 3,087 people in the Bristol Bay Borough, 908 in the Dillingham Census Area, and 162 in the Lake and Peninsula Borough (LPB) (ADLWD 2018a).

Figure 3.6-9: Current Bristol Bay Processing Locations



Notes: This figure was sourced externally and incorrectly shows the Friedman Family Fisheries in Dillingham and the Ekuk fisheries shore plant in Ekwok. Both of these facilities are in Ekuk.
The Chignik processing facilities service the Chignik area salmon fisheries. These runs return to their spawning grounds via the Gulf of Alaska and not via Bristol Bay.
Source: ADLWD 2018b.

From 1998 to 2018, the processing sector in Bristol Bay produced $7.87 billion of first wholesale value seafood products; processors derived $7.0 billion of this value (89.2 percent) from non-roe products from sockeye salmon (Table 3.6-6).[9] The next most valuable species across that time frame was Pacific herring (*Clupea pallasi*), a fishery that occurs every May in the Togiak/Twin Hills region of the Bristol Bay. Non-roe products from the remaining salmon species represented 3.5 percent, or $277.5 million, of wholesale value; other species and salmon roe products generated $90.2 million in wholesale value.

From 2004 to 2015, the processing sector provided jobs for an average of 4,106 workers; 2.4 percent of those workers were residents from the Bristol Bay watershed, and another 12.2 percent were Alaska residents from outside the watershed. The remaining 85.4 percent were from out of state. Collective watershed resident wages averaged $1 million per year from 2004 to 2015, and total worker wages averaged $29.4 million (Table 3.6-7).

[9] All values in $US 2019.

Table 3.6-6: Bristol Bay Wholesale Values by Species and Year ($US 2019)

Year	Sockeye Salmon	Herring	Chum Salmon	Chinook Salmon	Coho Salmon	Pink Salmon	Other Species	Total
1998	$195.8	$25.8	$1.9	$3.5	$2.0	$0.8	$12.5	$242.3
1999	$300.1	$42.4	$1.9	$0.7	$0.3	$0.0	$13.8	$359.2
2000	$247.1	$34.4	$2.6	$0.6	$2.2	$0.2	$19.3	$306.3
2001	$154.2	$29.3	$3.4	$0.5	$0.8	$0.0	$20.3	$208.7
2002	$135.9	$19.2	$1.9	$1.0	$0.4	$0.0	$12.3	$170.7
2003	$160.9	$24.5	$8.2	$1.1	$0.6	$0.0	$4.2	$199.6
2004	$239.7	$22.4	$2.9	$3.3	$5.1	$0.6	$0.3	$274.3
2005	$289.3	$27.5	$6.7	$2.7	$0.8	$2.3	$0.5	$329.7
2006	$302.9	$22.5	$11.9	$4.6	$1.2	$0.4	$0.4	$343.9
2007	$309.7	$16.5	$26.8	$2.1	$0.7	$0.0	$0.3	$356.1
2008	$318.7	$21.7	$11.2	$1.4	$1.4	$1.0	$0.1	$355.5
2009	$344.1	$26.1	$9.5	$1.3	$0.6	$0.1	$0.0	$381.7
2010	$450.4	$28.3	$8.5	$1.3	$1.5	$5.1	$0.0	$495.1
2011	$394.3	$22.3	$8.6	$3.4	$0.8	$0.0	$0.0	$429.3
2012	$311.5	$20.4	$7.5	$0.9	$1.3	$6.7	$0.0	$348.2
2013	$331.5	$23.8	$9.8	$0.7	$0.5	$0.4	$0.0	$366.8
2014	$414.3	$16.5	$4.7	$0.9	$3.1	$3.5	$0.0	$443.1
2015	$388.4	$17.4	$6.6	$1.6	$0.1	$0.0	$0.0	$414.2
2016	$483.6	$15.6	$9.6	$1.3	$1.1	$3.5	$5.8	$520.6
2017	$558.7	$14.0	$16.9	$1.8	$2.9	$0.2	$0.0	$594.5
2018	$687.9	$9.7	$21.0	$2.7	$4.1	$1.6	$0.3	$727.3
Total	**$7,019.0**	**$480.3**	**$182.1**	**$37.5**	**$31.5**	**$26.4**	**$90.2**	**$7,867.1**

Source: ADF&G 2018x

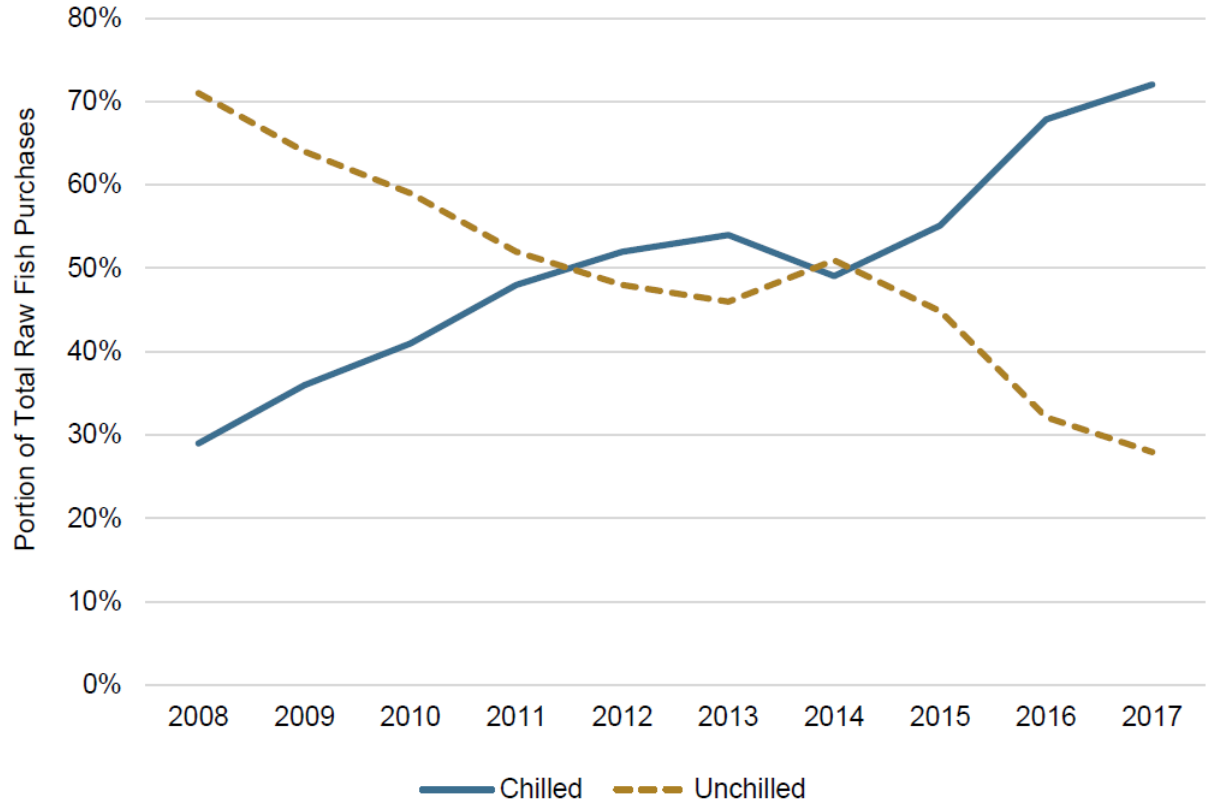
Table 3.6-7: Residency and Wages of Processing Workers

Year	Total Worker Count	Percent of All Processing Workers			Wages ($M Nominal/Not Inflation Adjusted)		
		Percent Non-resident Workers	Alaska Resident Ex-Watershed Workers	Watershed Resident Workers	Non-Resident Wages	Alaska Resident Wages, Ex-Watershed	Watershed Resident Wages
2004	3,594	83.0	13.5	3.5	$18.7	$2.2	$1.2
2005	3,357	81.6	14.9	3.5	$19.5	$2.3	$1.2
2006	3,090	84.2	12.3	3.5	$21.5	$2.4	$1.3
2007	3,655	84.1	12.4	3.5	$25.2	$3.2	$1.4
2008	3,987	83.8	13.5	2.7	$24.3	$3.1	$1.4
2009	4,855	87.0	11.8	1.2	$28.8	$2.9	$0.7
2010	4,886	87.0	11.3	1.7	$30.1	$3.2	$0.7
2011	4,574	87.8	10.5	1.7	$26.1	$2.7	$0.8
2012	4,026	85.6	12.0	2.4	$22.5	$2.6	$0.8
2013	4,328	84.7	13.3	2.0	$25.1	$4.2	$0.8
2014	4,791	87.6	10.5	1.9	$33.5	$3.7	$0.9
2015	4,134	85.9	12.0	2.1	$29.9	$3.5	$0.6

Source: ADF&G 2018x

Over the last decade, processors, the BBEDC, and the BBRSDA have focused several efforts on increasing raw product quality in the fishery. Processors consistently identify chilling fish at the point of harvest as the most important action that permit holders can take to increase product quality and have offered bonuses to permit holders who chill their fish. From 2008 to 2017, these bonuses added between 12 percent and 28 percent to the base price paid to permit holders, depending on the year. Permit holders responded to these incentives by increasing the portion of Bristol Bay salmon that is chilled immediately at harvest from 24 percent in 2008 to 73 percent in 2018 (Figure 3.6-10) (NEI 2018).

Figure 3.6-10: Raw Product Forms Processed in Bristol Bay, 2008-2017



Source: NEI 2018

3.6.1.4 Fishery Fiscal Contributions

The fiscal contributions of the Bristol Bay salmon fishery depend on the long-term health of the fishery. The harvest and processing of salmon in the Bristol Bay region provides millions of dollars in tax revenues to federal, state, and local governments. The federal government benefits through personal and corporate income taxes; the State of Alaska benefits from Alaska Fisheries Business Tax (AFBT) (AS 43.75.015); and local governments benefit from general taxes such as sales taxes, real and personal property taxes, and raw fish taxes on the ex-vessel value of salmon processed in the jurisdiction (EPA 2014). Each municipality generates revenue in different ways. The Bristol Bay Borough, home to many processing plants, relies on real/personal property taxes and raw fish taxes. There are not as many processing plants in city limits, but Dillingham is home to lay-down and repair yards for boats, and a major provisioning center for fishing crews; therefore, the city relies on sales and property taxes. The LPB lacks a centralized population area that could provide it with sales and property tax revenues, but instead relies on raw fish taxes (Table 3.6-8). Overall, these taxes depend on the long-term value of the fishery, the attractiveness of the fishery to investors who build business around the fishery, and total employment in the fishery, including processing workers.

The State of Alaska shares revenues generated from the AFBT with local municipalities. As noted in EPA (2014), the State does not break out AFBT revenue by species or fishery. However, in 2010, when the ex-vessel value of the Bristol Bay fishery topped $180 million in nominal terms, the Institute for Social and Economic Research estimated that the processors paid a minimum of $6.38 million in AFBT taxes (EPA 2014) (Table 3.6-9). In 2016 and 2017, the ex-vessel value of the fishery was $156 and $216 million, respectively. Therefore, one could conclude that in 2016 the AFBT payment was slightly less than it was in 2010 and that in 2017 it was slightly more than it was in 2010.

Table 3.6-8: Community Revenue Sources, 2017

Community	Sales Tax	Real Property Tax	Raw Fish Tax
Bristol Bay Borough	No	$4,918,466	$2,117,857
City of Dillingham	$2,528,395	$2,256,826	No
Lake and Peninsula Borough	No	No	$1,638,335
Egegik	No	No	$1,230,569
Nondalton	$0	No	No
Newhalen	$272	No	No

Source: ADCCED 2018

3.6.2 Upper and Lower Cook Inlet Commercial Fisheries

The project alternatives include a natural gas pipeline extending from north of Anchor Point on the Kenai Peninsula across Cook Inlet to Amakdedori port or Ursus Cove. This route crosses a complex set of fishing boundary areas, including the southern edge of the Upper Cook Inlet (UCI) Management Area, the Lower Cook Inlet (LCI) Management Area, and federally managed waters more than 3 miles offshore. The UCI Management Area, which includes fisheries dependent on salmon headed to the Kasilof, Kenai, Susitna, Little Susitna, and Matanuska/Knik drainages, is home to extensive oil and gas pipeline infrastructure, which has operated since the 1960s. The LCI Management Area includes commercial salmon fisheries and has historically included a commercial Pacific herring fishery. Both the UCI and LCI host State-managed groundfish fisheries for Pacific cod (*Gadus macrocephalus*), sablefish (*Anoplopoma fimbria*), walleye pollock (*Gadus chalcogrammus*), and rockfish species (i.e., black rockfish [*Sebastes melanops*], dark rockfish [*Sebastes cilatus*], and yelloweye rockfish [*Sebastes ruberrimus*]). In addition, Cook Inlet has hosted historic fisheries for Weathervane scallops (*Patinopecten caurinus*), Dungeness crabs (*Metacarcinus magister*), and a variety of hard shell clam fisheries, including razor clams (*Siliqua patula*).

Table 3.6-9: Estimates of Historic Fishing-Related Revenues 2000-2010

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Simple Lower-Bound Estimate of Fisheries Business Tax Obligations											
Ex-vessel value of Bristol Bay salmon harvests ($ 000)	$84,014	$40,359	$31,898	$46,684	$76,461	$94,556	$108,570	$115,763	$116,717	$144,200	$180,818
Canned share (assumed tax rate = 5.0%)	37%	32%	49%	39%	34%	32%	34%	35%	28%	25%	27%
Non-canned share (assumed tax rate = 3%)	63%	68%	51%	61%	66%	68%	66%	65%	72%	75%	73%
Lower-bound estimate of fishers tax obligation ($ 000)	$3,145	$1,467	$1,270	$1,760	$2,818	$3,439	$3,998	$4,287	$4,163	$5,061	$6,383
State of Alaska Share Business Tax Payments to Bristol Bay Boroughs and Cities ($ 000)											
Bristol Bay Borough	$1,440	$918	$494	N/A	$451	$835	$1,178	$1,296	$1,564	$1,543	$1,797
Lake and Peninsula Borough	$357	$246	$162	N/A	$113	$71	$99	$134	$138	$152	$215
Dillingham	$203	$176	$49	N/A	$100	$154	$148	$184	$176	$187	$239
Egegik	$30	$176	$78	N/A	$36	$29	$29	$74	$63	$63	485
Total	**$2,029**	**$1,517**	**$784**	**N/A**	**$700**	**$1,089**	**$1,454**	**$1,687**	**$1,941**	**$1,944**	**$2,335**

Sources: ADR 2018; EPA 2014

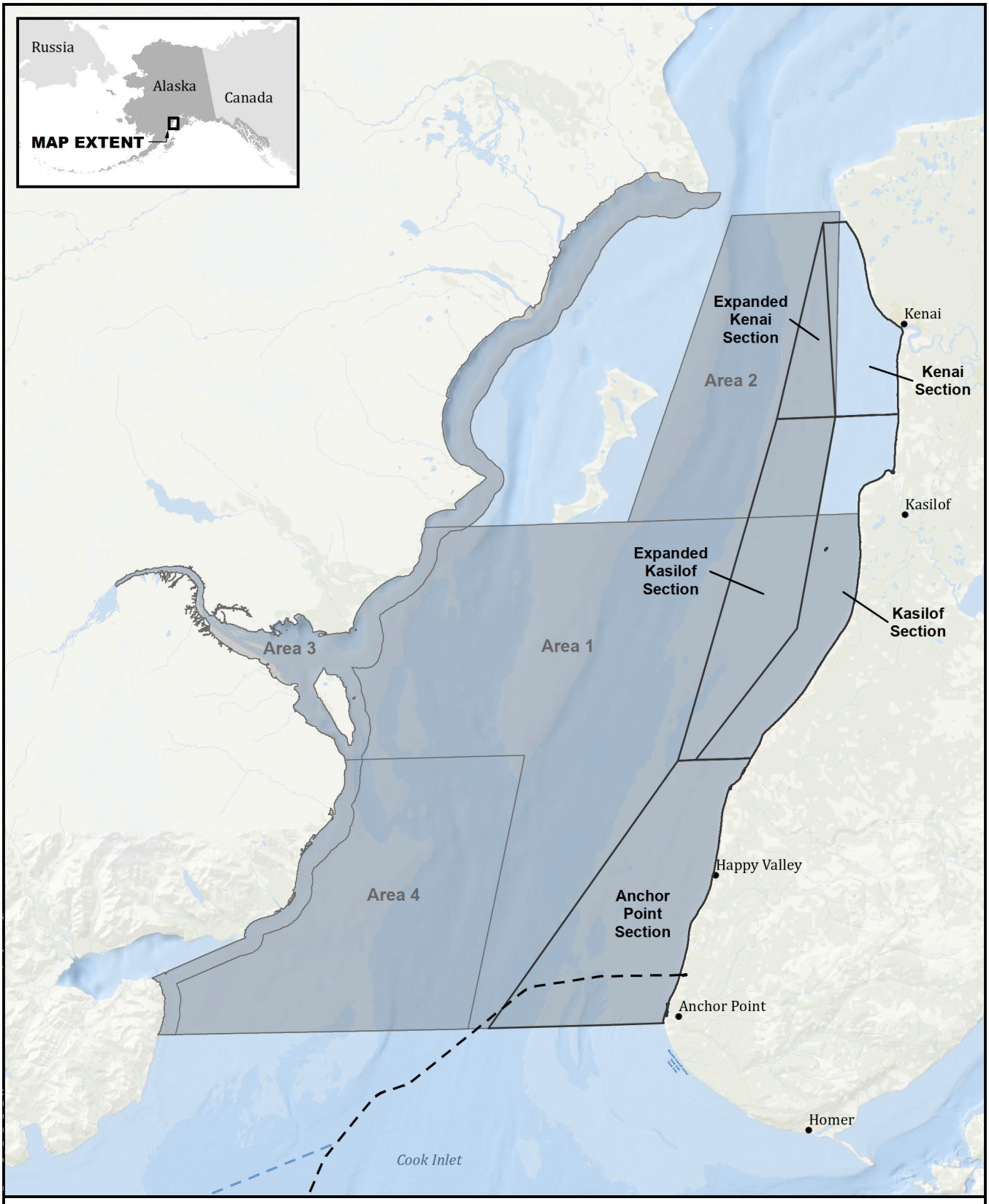
3.6.2.1 Upper Cook Inlet and Lower Cook Inlet Salmon

The UCI Management Area is one of the Alaska's most complex salmon management areas because management must balance escapement goals for multiple river systems and competing user groups, including commercial set net permit holders, commercial drift net permit holders, fresh and saltwater recreational anglers and guides, and personal use fisheries. From 2007 to 2016, commercial fisheries harvested an average of 3.48 million fish per year, generating $29.8 million in ex-vessel value on average. The 20-year average harvests for the fishery are 2.9 million sockeye salmon, 457,000 pink salmon, 288,000 coho salmon, 421,000 chum salmon, and 14,600 Chinook salmon (Shields and Frothingham 2018). Although 20-year average harvests for sockeye salmon are representative of more recent trends, 10-year average harvests for the other species have been smaller than the 20-year harvests.

The 10-year average harvests are 2.9 million sockeye salmon, 245,000 pink salmon, 167,000 coho salmon, 149,000 chum salmon, and 9,500 Chinook salmon (Shields and Frothingham 2018). These smaller harvests result from changes in abundance (e.g., Chinook salmon) and changes in commercial management to allow more late-season harvest opportunities for northern Cook Inlet recreational anglers fishing coho salmon. The project's pipeline would originate just north of Anchor Point, with the highest potential to affect drift net commercial fisheries and saltwater recreational anglers in the vicinity of the pipeline. Although the UCI Management Area primarily encompasses salmon fisheries, the ADF&G also manages small commercial herring, smelt, and razor clam fisheries within the area boundaries.

The project's pipeline would pass through ADF&G drift gillnet statistical areas 244-63 and 244-70 before passing into the LCI Management Area (Figure 3.6-11). The pipeline would be south of any set net fisheries in ADF&G statistical area 244-21 (encompassing the unnamed/unshaded area east of Area 244-61 in Figure 3.6-11). It is not possible to determine the amount of drift fleet harvest in areas 244-63 and 244-70 because the ADF&G does not collect harvest data or attempt to estimate harvest in these specific areas. Instead, harvest from areas 244-60, 245-80, 245-90, 244-70, and 244-63 are reported in total as "Area 244-60" or "Area 1/District Wide." In 2016, the drift net fleet harvested 728,037 of the 1,266,696 sockeye salmon from this aggregate area, an amount equal to 57.5 percent of all UCI Management Area drift sockeye harvests. In the same year, the combined areas produced 70 percent of the coho salmon harvest and nearly two-thirds of the pink salmon harvest (Shields and Frothingham 2018). Despite the uncertainty regarding the magnitude of the overlap between drift net fleet harvest activities and the project's natural gas pipeline, the potential for conflict is low because of the depth of the pipeline on the sea floor, and the specifications of drift gillnet gear (ADF&G 2017c). An exception would be during construction, when some modest adjustments of gear deployment might be required.

The harvest in the LCI Management Area focuses primarily on pink and sockeye salmon from a combination of hatchery and wild sources and is much smaller than UCI salmon harvests. Harvests in this area average $2.95 million per year in ex-vessel value between purse seine, set gillnet, and hatchery recovery operations. On average, 35 to 40 permit holders participate in salmon fisheries in these areas per year (Hollowell, Otis, and Ford 2017). Salmon harvests occur in most years in the Amakdedori/Chenik sub-district of the LCI. Between 1997 and 2018, fishing occurred from 2004 to 2014, and from 2016 to 2018. In the years when fishing occurred, permit holders harvested an average of 57,596 sockeye salmon, 3 coho salmon, 791 pink salmon, and 353 chum salmon. During these years, sockeye salmon harvest ranged from fewer than 5,500 fish to more than 171,000 fish, with a median harvest of 54,205 sockeye salmon (ADF&G 2018q).



Sources: PLP 2019-RFI153; ADFG

US Army Corps of Engineers

4 0 4 8
Miles

ADF&G Central District
- Drift Gillnet Areas
- Drift Gillnet Corridors

Action Alternatives
- Natural Gas Pipelines
- Alternative 1a
- Alternative 2

UPPER COOK INLET DRIFT NET MANAGEMENT AREAS

PEBBLE PROJECT EIS

FIGURE 3.6-11

Commercial fishing activity near the Diamond Point port site differs from fishing activity at the Amakdedori port site (Alternative 1a and Alternative 1). ADF&G LCI finfish management reports show fishing activity in the Cottonwood Bay sub-district (249-83) where the Diamond Point port would be located (Hollowel, Otis, and Ford 2017). The data provided by the ADF&G indicated that chum salmon were harvested near the port site in 15 of 32 years between 1986 and 2017, and pink salmon were harvested in 10 of 32 years during the same period. The average harvest in years when harvest was recorded was slightly more than 27,000 chum salmon and approximately 3,600 pink salmon. The same ADF&G comments indicate that the escapement goal for Cottonwood Creek is approximately 5,000 to 12,000 chum salmon per year and that total district harvest has been as high as 160,000 (ADF&G 2018q).

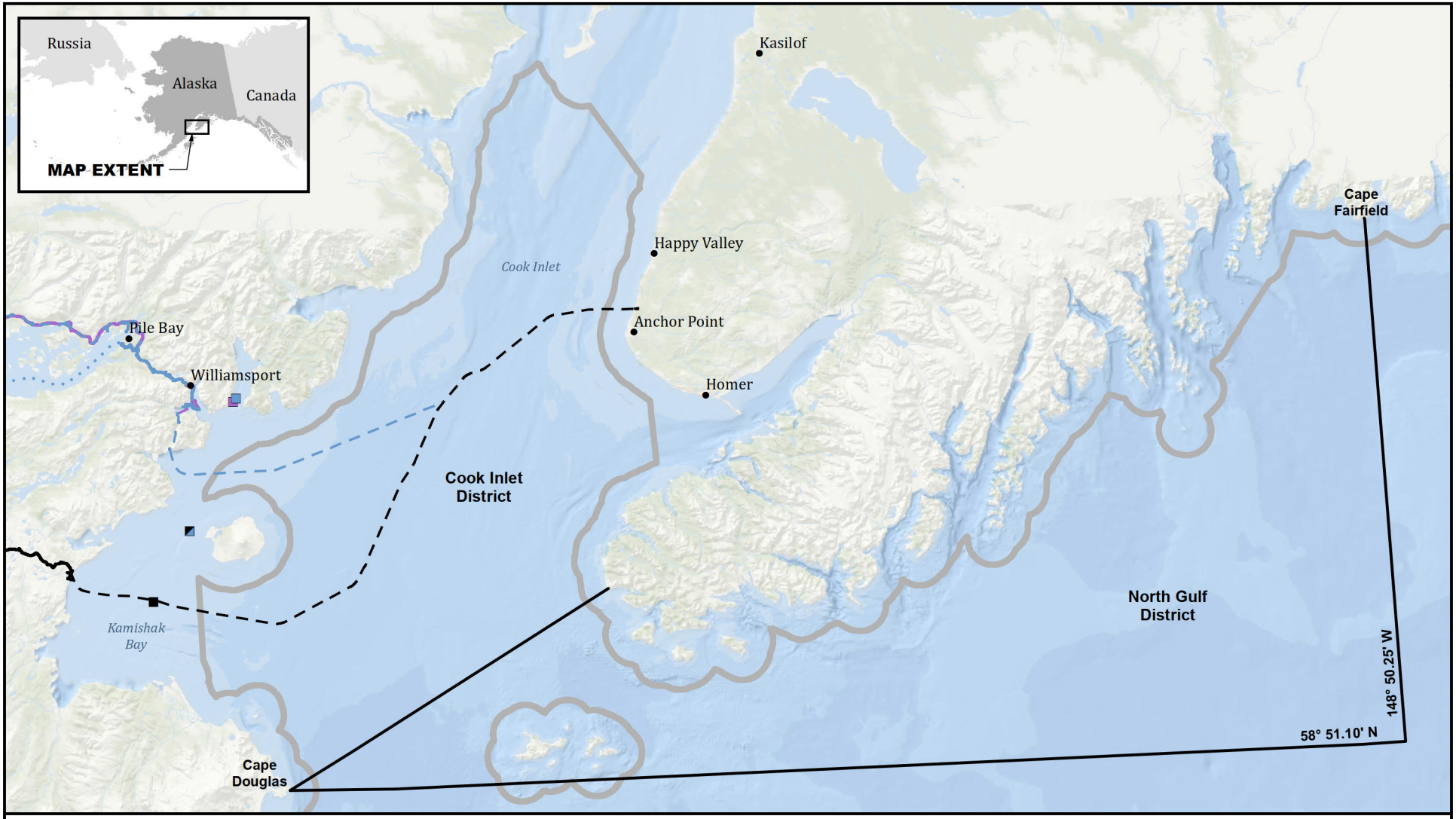
The ADF&G also manages a commercial Pacific herring fishery in the LCI Management Area; however, the spawning biomass has been too small to allow the opening of this fishery since 2000.

3.6.2.2 Upper Cook Inlet and Lower Cook Inlet Groundfish

The pipeline would cross waters within the 3 nautical miles of shore managed by the State for groundfish fisheries for Pacific cod, sablefish, rockfish, and walleye pollock (Figure 3.6-12). These species are generally harvested by baited longlines or pots laid across the ocean floor but can also be harvested using mechanical jigs or hand troll gear. ADF&G data indicate that Pacific cod is commercially the most important species of this group, with Cook Inlet district harvests averaging between 1.7 and 3 million pounds annually; ex-vessel values average less than $2 million per year. Much of this harvest takes places in Kachemak Bay, south and east of the pipeline (Rumble et al. 2016b). The federally managed commercial Pacific halibut fishery in the Cook Inlet district had an average annual harvest of approximately 437,000 pounds of halibut over the past 10 years, with 66 percent of that harvest occurring in the federal waters between Kamishak and Kachemak bays. In 2017, 42 vessels participated in the halibut fishery. Other commercially important species harvested in the Cook Inlet district include lingcod, spiny dogfish, and skate species.

The pipeline would cross the Cook Inlet district and federally managed waters in Cook Inlet beyond 3 nautical miles from shoreline. Commercial fisheries in these areas include fisheries for Pacific halibut, Pacific cod, and other groundfish (Figure 3.6-13). The halibut fishery is co-managed with the State of Alaska and the federal government, operating under limits established by the International Pacific Halibut Commission. The fishery for halibut uses longlines consisting of baited hooks laid on the ocean floor, and the cod fishery primarily uses longlines and pots. Federal management areas are much larger than State management areas; therefore, harvesters have greater flexibility to avoid fixed assets such as pipelines and undersea cables in federal waters. For example, halibut harvesters holding halibut quota for International Pacific Halibut Commission Area 3A, which includes Cook Inlet, can fish anywhere in the 3A management area. However, flexibility is not without cost. Greater travel distance from home ports increases operating costs and, if commercial harvesters are forced to harvest from less familiar or less productive areas, increases uncertainty.

The following sections describe current and historical fishing for each groundfish or shellfish species or species group.



Sources: PLP 2020-RFI168;
PLP 2019-RFI153; ADFG

US Army Corps of Engineers

10 0 10 20
Miles

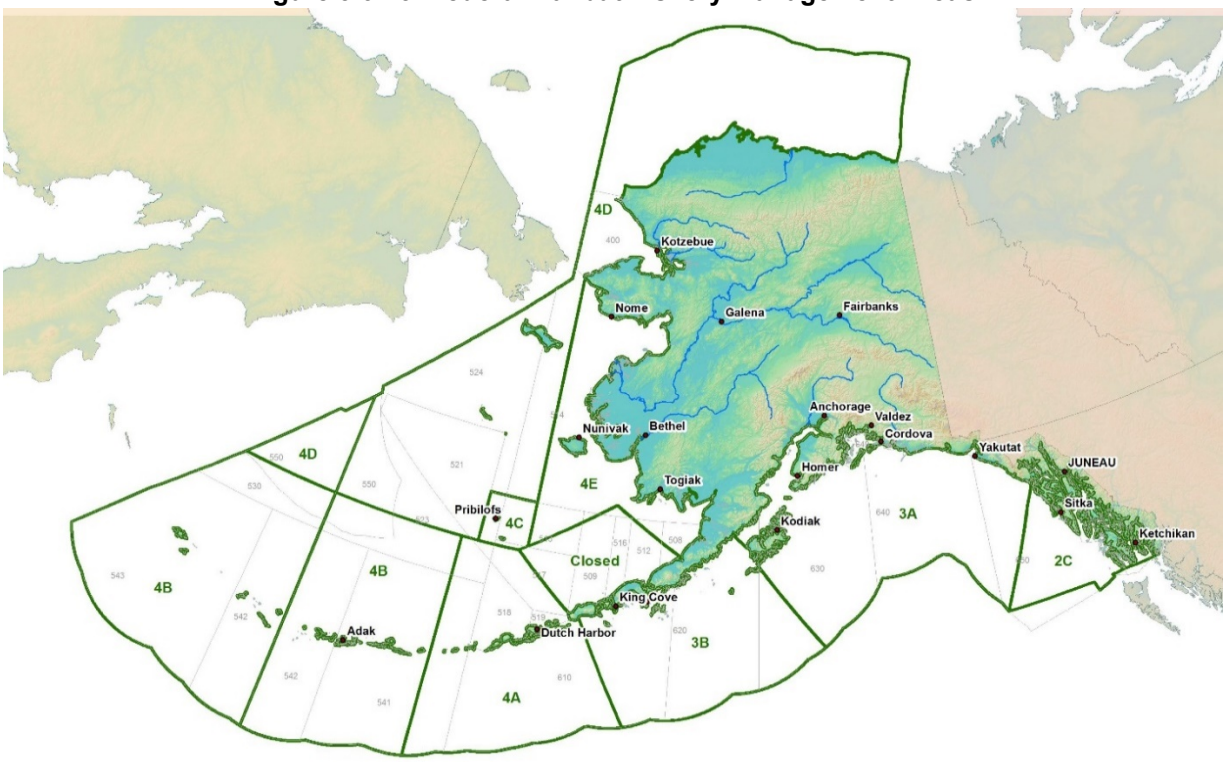
ADF&G District Boundary
Three Nautical Mile Line
Action Alternatives
Natural Gas Pipelines
Lightering Locations
Ferry Routes
Alternative 1a
Alternative 2
Alternative 3

COOK INLET MANAGEMENT AREA
GROUNDFISH AREAS AND DISTRICT BOUNDARIES

PEBBLE PROJECT EIS

FIGURE 3.6-12

Figure 3.6-13: Federal Halibut Fishery Management Areas



Source: NOAA 2018d

Pacific Halibut

The Pacific halibut fishery is Cook Inlet's most valuable groundfish fishery. In 2018, quota holders made more than 300 landings of halibut, totaling 2.25 million pounds or 14 percent of all US landings of the species. The port of Homer had the second-largest total of landed halibut weight in the country, after Sitka in 2018 and Kodiak in 2017 and 2016. In these years, the port of Homer experienced a similar number of landings and total landed weight. The halibut season runs from March through November and operates on a quota system under which quota owners pick when and where to fish, subject to other regulations. Area 3A halibut quota can be fished anywhere from Kodiak to east of Yakutat.

Pacific Cod

The Pacific cod fishery is the largest commercial groundfish fishery by value and weight in the Cook Inlet area, accounting for approximately 90 percent of groundfish ex-vessel value in 2015. About half of the total harvest occurs in the Cook Inlet district (waters of Cook Inlet north of a line from Cape Douglas to Point Adam). Fishers catch Pacific cod using jig gear, pots, and longlines, and participate in two fishing seasons: the state waters fishery and the "parallel season" fishery, which runs concurrently with the federal fishing season. For combined federal and state waters of the Cook Inlet district over the past 20 years, annual Pacific cod harvest has averaged approximately 2.7 million pounds, with a high of approximately 4.4 million pounds, about 40 percent of which typically occurs in the federal waters between Kamishak and Kachemak bays. From 1997 to 2015, Pacific cod harvest in the Cook Inlet district state-waters fishery averaged 1.2 million pounds per year. The 10-year average is slightly higher at 1.4 million pounds, with the parallel season fishery adding another 350,000 to 500,000 pounds of harvest on average. The ex-vessel value of the fishery in the Cook Inlet district in 2017 was slightly less than $1 million,

with 37 vessels harvesting Pacific cod. ADF&G data indicate that nearly all the Cook Inlet district harvest occurs south of Anchor Point in Kachemak Bay, with less than 50,000 pounds of total harvest from 2012 to 2015 in the area encompassing Kamishak Bay (Rumble, Russ, and Russ 2016). The Pacific cod fishery in the Gulf of Alaska was closed in 2020 due to low abundance.

Walleye Pollock, Lingcod, Sablefish, and Other Species

The Cook Inlet Management Area does not host a walleye pollock directed fishery, but the species may be kept as bycatch. Total harvest in the entire management area, including the North Coast district and the Cook Inlet district, ranges from less than 5,000 pounds per year to less than 50,000 pounds per year.

Lingcod harvests in the Cook Inlet Management Area (including federal waters) have varied dramatically in recent years, from 6,700 pounds in 2015 to more than 52,000 pounds in 2018 (ADF&G 2019a). ADF&G management reports indicate that the majority of this harvest comes from state waters and that "virtually all" of the harvest comes from the North Gulf district outside of the EIS analysis area (Rumble, Russ, and Russ 2016).

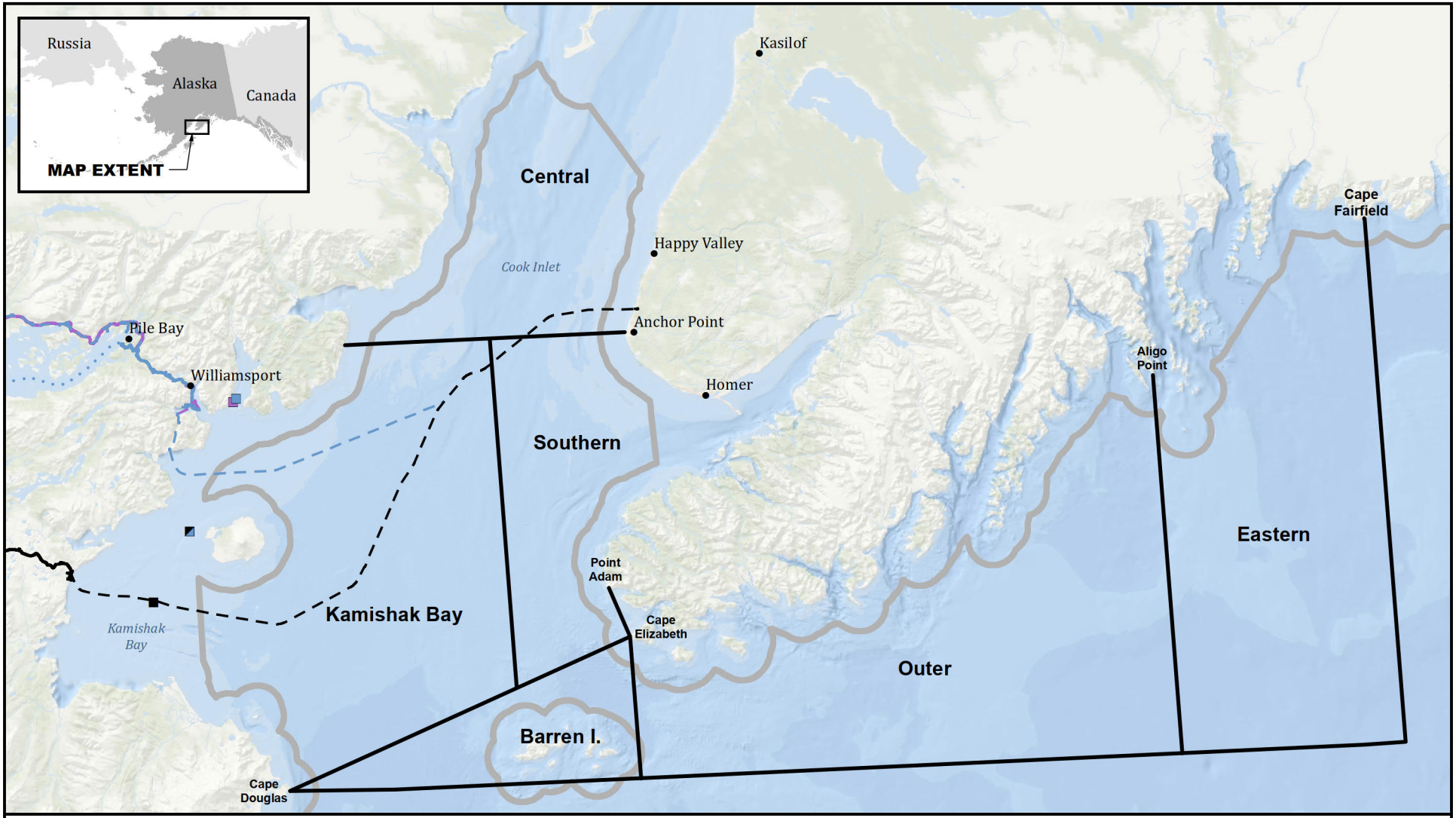
In 2018, seven commercial harvests of nearly 25,000 pounds of sablefish came from Cook Inlet Management Area waters (ADF&G 2019a). This amount is less than half the historical harvest experienced between 2008 and 2014 and a more than two-thirds decline from the 83,000 pounds harvested in 2005 (Rumble, Russ, and Russ 2016).

Rockfish Species

The rockfish complex includes dozens of species of the genus *Sebastes.* In the Cook Inlet Management Area, the majority of the rockfish harvest comes from pelagic shelf rockfish, such as black rockfish and dark rockfish. Demersal rockfish, primarily yelloweye rockfish, make up the second-largest harvest group. According to ADF&G management reports, "Within the Cook Inlet Area, the [North Gulf District] historically yielded greater than 95 [percent] of the commercial rockfish harvest during any given year and also supported active sport and personal use rockfish fisheries, with the exception of a low of 85 [percent] in 2008. The rocky, high-relief habitat typical of the [North Gulf District] was more suitable to nearshore rockfish than the glacial-mud substrate of the [Cook Inlet District]" (Rumble, Russ, and Russ 2016). Thus, the vast majority of commercial rockfish effort and harvest is outside of the EIS analysis area of the Cook Inlet district.

3.6.2.3 Upper Cook Inlet and Lower Cook Inlet Shellfish and Miscellaneous Species

The Cook Inlet Management Area (i.e., ADF&G Registration Areas H and G) includes several active or historic shellfish fisheries. In these areas, the ADF&G manages all commercial shellfish in state and territorial waters, as well as delegated fisheries in the federal waters of the exclusive economic zone. Current and historic resources targeted in these management areas include weathervane scallops, octopus and squid, shrimp, hard-shell clams and mussels, razor clams, Dungeness crab, sea cucumbers, and green sea urchins (Rumble et al. 2016b). The project would interact with this management area and associated fisheries through the positioning of the natural gas pipeline, which would run from just north of Anchor Point in central shellfish district, through the northwestern corner of the Southern shellfish district, and through the Kamishak Bay shellfish district (Figure 3.6-14). The pipeline would pass through Kamishak Bay and Amakdedori port under Alternative 1a and Alternative 1, and through Ursus Cove, before reaching the Diamond Point port area under Alternative 2 and Alternative 3.



Sources: PLP 2020-RFI168;
PLP 2019-RFI153; ADFG

US Army Corps of Engineers®

10 0 10 20
Miles

Shellfish Districts
Three Nautical Mile Line
Action Alternatives
Natural Gas Pipelines
Lightering Locations
Ferry Routes
Alternative 1a
Alternative 2
Alternative 3

COOK INLET MANAGEMENT AREA AND SHELLFISH DISTRICTS

PEBBLE PROJECT EIS

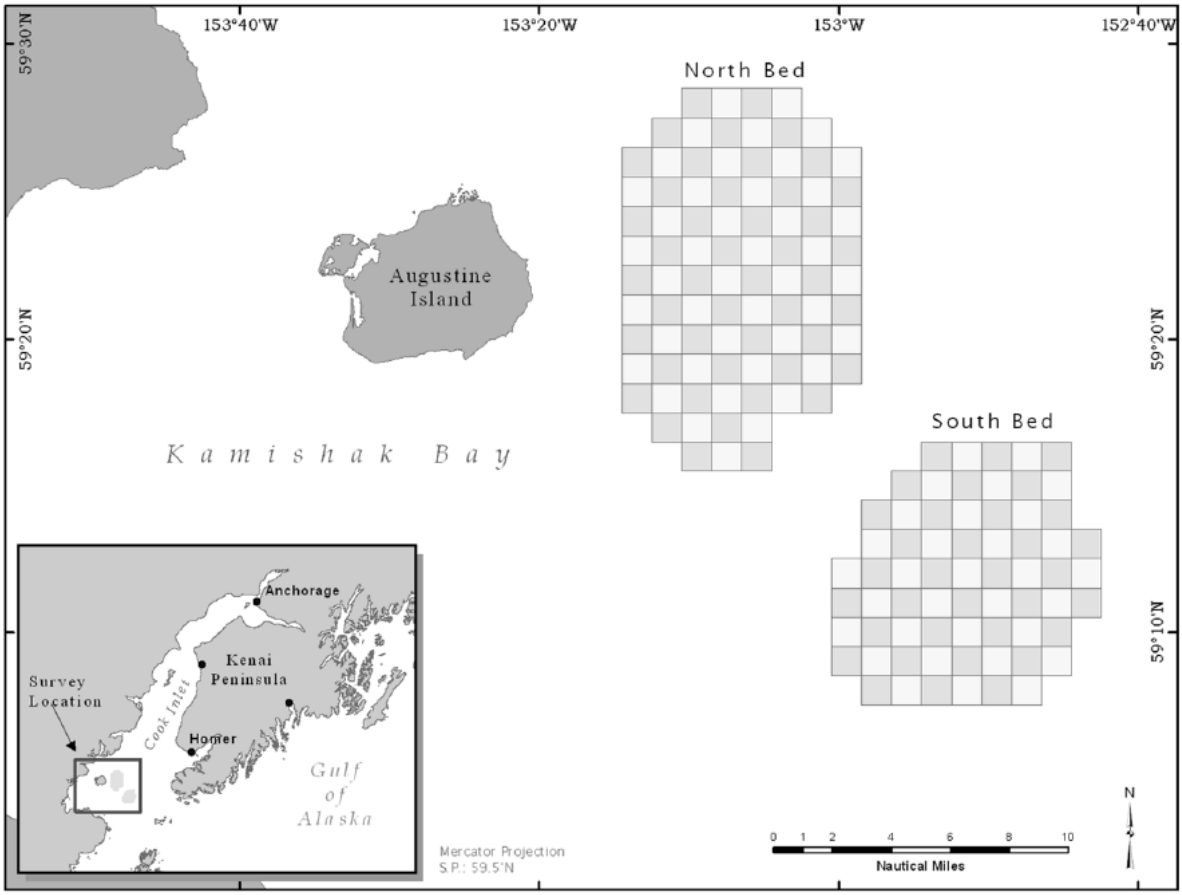
FIGURE 3.6-14

Weathervane Scallops Fishery

Kamishak Bay is home to a historic Weathervane scallop fishery composed of two scallop beds east of Augustine Island (Figure 3.6-15). This fishery is still actively managed by the ADF&G but has been intermittently closed due to low abundance. The northern bed is historically the more biologically and commercially productive of the two beds. From 1993 to 2012, an average of roughly two vessels per year harvested from the bed, with an average total harvest of 11,000 to 14,000 pounds. In 1995, 2003, 2007, 2008, and 2009 the fishery was either closed or had no vessels pursuing the fishery. The bed was closed in 2013 and 2014, opened in 2015 and 2016 when it was worked by one vessel, opened but not worked in 2017, and closed again in 2018.

The southern bed is the less productive of the two beds. ADF&G records show that since 1993 harvest from the southern bed was only recorded in 2002, 2003, and 2004. In 2007 and 2008, the bed was open for harvest, but no harvest was recorded. In all other years, the bed has been closed (Rumble et al. 2016b; NPFMC 2018).

Figure 3.6-15: Kamishak Bay Shellfish Beds



Source: Rumble et al. 2016b

Octopus Fishery

Octopus are a bycatch species harvested incidentally by other fisheries, particularly in the Pacific cod pot fishery. Every year since 2007 (with the exception of 2010), ADF&G has issued an Emergency Order banning retention of incidentally harvest octopus when the harvest has approached the Guideline Harvest Level of 35,000 pounds. Over the past 20 years, an average

of 11 vessels per year have reported octopus landings totaling 30,000 pounds for the year (Rumble et al. 2016b; ADF&G 2019a).

Pacific Herring Fishery

The Kamishak Bay district of the LCI includes a historical Pacific herring fishery, which has been closed since the 2000 season. Between 1961 and 1999, the fishery harvested an average of 2,520 short tons of Pacific herring in the district (Hollowell, Otis, and Ford 2019).

Shrimp, Dungeness Crab, Tanner Crab, Red King Crab, and Hard Clams Fisheries

Cook Inlet was home to a historical fishery for shrimp, which averaged 5 million harvested pounds per year between 1969 and 1983. The fishery closed in 1987 and 1997 because of low abundance (Rumble et al. 2016b).

Although a Dungeness crab fishery existed in the southern district until the 1990s, there is currently no open fishing season for the species in the Cook Inlet Management Area. Similarly, tanner crab, red king crab, and hard-shell clams were harvested in Kachemak Bay until 1981, 1994, and 2006, respectively. There have been no recorded commercial harvests since (Rumble et al. 2014, Rumble et al. 2016b). There are no razor clam fisheries in the EIS analysis area.

3.6.3 Guided and Unguided Recreational Fishing

3.6.3.1 Freshwater Fishing

The EIS analysis area hosts numerous freshwater fishing resources that anglers use primarily to target Chinook salmon, sockeye salmon, rainbow trout (*O. mykiss*), and other salmonid species. They value the area's low angler density, catch rates, and wilderness fishing conditions (EPA 2014). In turn, these well-known fisheries resources support sport fishing lodges, fishing guides, and related services such as air taxis, and generate revenue for the state of Alaska and local municipal governments. There are some special management areas for rainbow trout along the upper Nushagak River and Upper Talarik Creek.

The ADF&G measures recreational fishing effort via the annual SWHS. The SWHS measures effort and catch (i.e., harvest plus catch and release) across a set of geographic statistical areas via a mail survey distributed to a sample of individuals who purchased an Alaska fishing license in the year being surveyed. Each year, the ADF&G mails 47,000 SWHSs to anglers who bought licenses; it divides anglers into four sample frames: Alaskans, non-Alaskan US citizens, Canadian residents, and all other anglers. In 2016, response rates across the frames varied between 26 percent and 50 percent; the ADF&G expects approximately 17,000 responses each year (ADF&G 2017d).

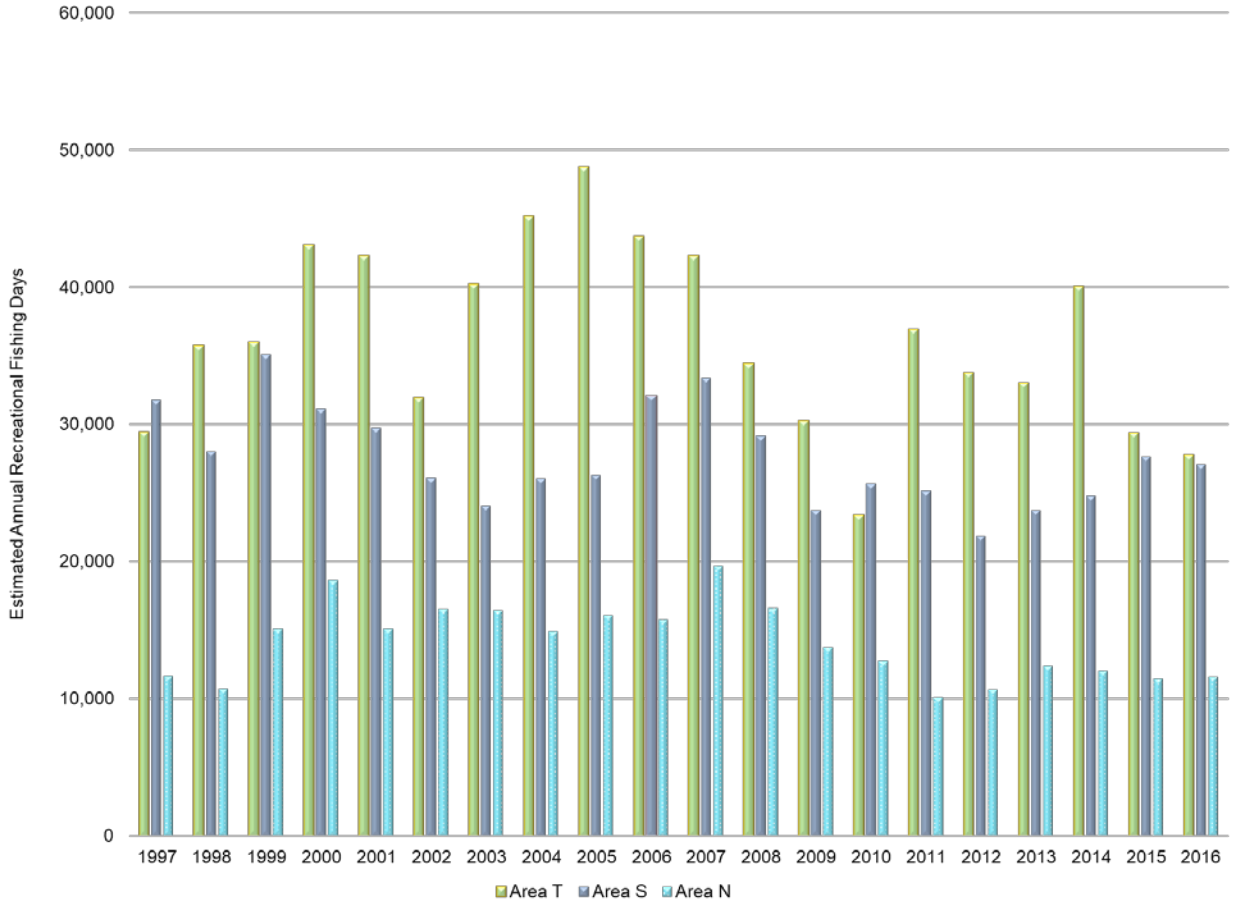
Figure 3.6-16: Map of ADF&G Recreational Fishing Areas

Source: ADF&G 2018d

The ADF&G SWHS statistical areas S, T, and N contain the waterbodies hydrologically connected to the project area; Area S contains the Kvichak River drainage and Area T contains the Nushagak, Wood, and Togiak river drainages (Figure 3.6-16). In 2016, the ADF&G estimated that anglers fished approximately 27,000 days in Area S, nearly 28,000 days in Area T, and 11,600 days in Area N; the vast majority of these days were freshwater fishing days (Figure 3.6-17). The EIS analysis area also includes Area P, which is not hydrologically connected to the project area.[10]

[10] Area P includes the eastern terminus of the natural gas pipeline, where the pipeline would connect with the existing natural gas supply system on the Kenai Peninsula. The primary facility would be a new compressor station connecting to existing natural gas infrastructure north of Anchor Point and the Anchor River, which hosted an estimated 12,699 angler days in 2016. The facility would not be expected to affect angling in the area except for minor increases in construction traffic during the construction phase; for this reason, Area P is not discussed in further detail in this section.

Figure 3.6-17: Recreational Fishing Effort, 1997-2016



Source: ADF&G 2018d

Each year, the ADF&G publishes angler count, fishing day, and harvest estimates of waterbodies for which that they have received enough completed surveys to generate results of a certain statistical reliability. The SWHS combines all waterbodies for which there are not enough responses into an "other" category. Busier waterbodies generate enough angler survey responses for the ADF&G to create effort estimates every year, but waterbodies that are less busy may only generate enough results a couple of times in a 10-year period. The absence of an estimate in a particular year for one of these waterbodies does not indicate the absence of effort in that year, but rather a lack of angler survey responses. Therefore, for these waterbodies it is particularly important to look at effort across time to get a stronger sense of measured effort.

From 1997 to 2016, angler responses allowed the SWHS to estimate angling effort for eight distinct waterbodies, drainages, or systems in Area T. The survey identified the Nushagak River (excluding the Mulchatna drainage), the Wood River System, and the Togiak River System as the most frequently fished systems. These three systems accounted for 84 percent of estimated angling effort between 1997 and 2016. The Nushagak River received the most angler effort in the area, accounting for slightly more than 44 percent of total angler days. Data do not differentiate where along the Nushagak effort takes place; however, comments from the US Environmental Protection Agency (EPA) on the Draft EIS suggest that there are four areas of concentrated recreational effort in the drainage: the lower 15 miles of the Nushagak River near the village of Portage Creek; the middle section of the Nushagak River in the vicinity of the village of Ekwok; the section of the Mulchatna River between the Stuyahok and Koktuli Rivers;

and the upper Nushagak River from the outlet of the Nuyakuk River upstream to the outlet of the King Salmon River. Of the areas mentioned, the lower portion of the Nushagak River and the fishery in the immediate vicinity of the Nuyakuk River outlet have long been the most significant (EPA 2019c). The Wood River system accounted for 27 percent of area effort, and the Togiak River accounted for 13 percent. The Mulchatna River, which eventually flows into the Nushagak River, is the only system in Area T known to be directly connected to the project area via surface waters (of the Koktuli River); the river accounted for 6.4 percent of estimated angling effort in the 20 years between 1997 and 2016. However, average annual angling effort on the Mulchatna River was 45 percent lower from 2007 to 2016 than it was from 1997 to 2006 (Table 3.6-10).[11]

Table 3.6-10: Area T Waterbodies, Average Annual Angler Days and SWHS Appearances

Waterbody	1997-2006		2007-2016	
	Average Annual Days	Years as a Specified Waterbody	Average Annual Days	Years as a Specified Waterbody
Nushagak River	16,990	10	14,958	10
Wood River System	10,992	10	8,416	10
Togiak River System	4,601	10	4,984	10
Tikchik-Nuyakuk Lake System	2,053	10	1,950	6
Mulchatna River Drainage*	2,999	10	1,672	10
Nuyakuk River Drainage	--	0	1,327	6
Other Waterbodies	1,798	10	1,065	10
Kulukak River	--	0	758	1
Chilikadrotna River	1,031	2	--	0
Freshwater Total	**39,638**	**10**	**33,137**	**10**

Notes:

-- = Unknown
SWHS = Statewide Harvest Survey

*This estimate includes any activity on the Koktuli River. Data from the ADF&G from 2007 through 2016 indicate that, on average, 2.3 anglers per year return harvest surveys indicating they fish the Koktuli; this number is below the threshold for estimating effort on a specific waterbody (Borden 2018). In comparison, Lower Talarik Creek responses ranged from 2 to 17 and averaged 9.5 responses per year in same period. The department only estimated effort for Lower Talarik Creek when the number of responses in a single year reached the mid-teens at a minimum. Responses indicating effort on the Koktuli are typically a fraction of the ADF&G's minimum for estimating and publishing specific waterbody effort.

Source: ADF&G 2018d

Angler responses allowed the ADF&G to estimate angling effort for twice as many waterbodies in Area T than in Area S in the 1997 to 2016 period. However, Area S averages roughly one-quarter fewer angler days than Area T. The most popular waterbodies in Area S are the Alagnak/Branch River, the Kvichak River, the Copper River (tributary of Iliamna Lake), and the Lake Clark and

[11] Several cooperating agencies noted during their review of the Draft EIS that the angler effort estimates underestimated the importance of both the Mulchatna and the Koktuli to a subset of anglers who conducted independent or guided "float trips" during which the anglers float in rafts down the waterbody and are picked up by airplane at the end of the trip.

Iliamna Lake drainages. Waterbodies included in the SWHS annual report that have the potential to be directly affected by the project, including transportation activity, are the Newhalen River, Lower Talarik Creek, Kvichak River, Gibraltar River, and Iliamna Lake (Table 3.6-11).

Table 3.6-11: Area S Waterbodies, Average Annual Angler Days, and SWHS Appearances

Waterbody	1997-2006		2007-2016	
	Average Annual Days	Years as a Specified Waterbody	Average Annual Days	Years as a Specified Waterbody
Alagnak (Branch) River drainage	9,394	10	6,320	10
Kvichak River	7,813	10	5,167	10
Copper River (tributary of Iliamna Lake)	2,118	7	2,396	10
Lake Clark drainage	2,133	10	2,371	10
Other Waterbodies	2,133	10	2,371	10
Iliamna Lake and tributaries	1,931	7	2,187	10
Newhalen River drainage	2,972	7	1,862	7
Kulik River	1,073	7	1,652	10
Moraine Creek	1,063	6	1,616	10
Iliamna River	--	0	990	6
Kukaklek River	--	0	724	6
Gibraltar River drainage	--	0	655	7
Funnel Creek	--	0	515	4
Lower Talarik Creek	576	6	441	3
Battle River	--	0	436	5
Tazimina River	589	1	--	0
Gibraltar Lake	630	1	--	0
Freshwater Total	**29,036**	**10**	**26,239**	**10**

Notes:

-- = Unknown
SWHS = Statewide Harvest Survey

Source: ADF&G 2018d

In Area N, the SWHS estimated an average of 15,102 fishing days between 1997 and 2006, and 13,113 days between 2007 and 2016. Angler effort is concentrated north of the project area for all the named sites, with the exception of the Kamishak River. The Kamishak River, which appears once as a named site in 20 years' worth of data, is south of the project area near the McNeil River State Game Sanctuary, roughly 20 air miles from the Amakdedori port site (Table 3.6-12).

Table 3.6-12: Area N Waterbodies, Average Annual Angler Days and SWHS Appearances

Waterbody	1997-2006		2007-2016	
	Average Annual Days	Years as a Specified Waterbody	Average Annual Days	Years as a Specified Waterbody
Wolverine Creek mouth	3,783	3	2,393	10
Other Freshwater	2,693	10	2,249	10
Chuitna River	2,634	10	1,412	6
Kustatan River	2,557	7	0	0
Big River Lakes	1,615	8	2,168	10
Silver Salmon Creek	1,087	10	856	8
Theodore River	850	9	765	3
Crescent Lake	--	0	692	1
Kamishak River	--	0	276	1
Freshwater Total	**15,102**	**10**	**13,113**	**10**

Notes:
-- = Unknown
SWHS = Statewide Harvest Survey
Source: ADF&G 2018d

In addition to the SWHS, the ADF&G collects data on guided saltwater and freshwater fishing trips via the Alaska Guide Logbook Program. Under the program, Alaska guides record data on each day they spend guiding, including data and location of the trip(s), the license numbers of guided anglers, harvest, and catch. Although SWHS data are superior in their breadth, including both guided and unguided angler effort, logbook data are a census of guided trips as opposed to estimates based on a survey. Table K3.6-7 in Appendix K3.6 summarizes the 2011 through 2014 program data for SWHS areas N, P, S, and T. Table 3.6-13 shows the summarized data for "high interest" waterbodies, which would either be directly affected by the project, have potential for cumulative or downstream effects, or have been mentioned in public scoping. The data provide insights into guided effort in the area, including:

- The vast majority (i.e., 95+ percent) of all guided Nushagak/Mulchatna effort is on the Nushagak River.
- The Copper River, which is on the eastern shores of Iliamna Lake south of pipeline alternatives leading to Diamond Point port, and north of the alternatives leading to Amakdedori port, hosts an average of nearly 1,500 guided fishing days per year.
- The Gibraltar River, which would be crossed by the port access road leading to Amakdedori port in Alternative 1a and Alternative 1, hosts an average of fewer than 300 guided fishing days per year.
- The Newhalen River, which would be crossed by the, Iliamna spur road in Alternative 1 or the primary mine access road in Alternative 1a, Alternative 2, and Alternative 3, hosts fewer than 200 guided days per year and only appeared in 3 years' worth of data out of a maximum of 4 years.
- Upper and Lower Talarik Creek hosted fewer than 200 guided angler days per year, combined. On average, Lower Talarik Creek is the more popular of the two waterbodies, hosting 75 percent of combined effort.
- The Koktuli River does not appear in the program data for these years.

3.6.3.2 Estimates of Economic Contribution

Sport fishing is a consistently important economic activity in the Bristol Bay region (EPA 2014). Anglers spend substantial amounts of money on transportation, lodging and meals, equipment, and guide services, amongst other expenditure categories. These expenditures help fuel local economies and generate local tax revenues for the City of Dillingham, the LPB, and the Bristol Bay Borough. Although annual estimates of sport fishing's economic contribution are not available, EPA (2014) and Duffield et al. (2007) provide estimates of annualized value based on 2005 sport fishing effort. The Duffield et al. (2007) estimates indicate that in 2005, per trip expenditures ranged from $426 for watershed residents to $7,933 for those staying at remote lodges. Watershed resident anglers averaged 11.54 trips per year, and ex-watershed Alaska residents and non-residents averaged 1.3 and 1.49 trips per year[12] (Table 3.6-14).

Table 3.6-13: Comparative Estimates of Sport Fishing Effort, Days

Waterbody	Average of 2011-2014 Data			
	Appear-ances in Data (Max=4)	Business Operating	Trips	Days
Area N				
Kamishak River	4	8	133	356
Area P				
Anchor River	4	7	52	115
Area S				
Copper River (Iliamna Lake Area)	4	11	613	1,466
Kvichak River	4	19	548	1,288
Iliamna River	4	7	185	430
Gibraltar River	4	9	123	289
Iliamna Lake	4	8	76	223
Newhalen River	3	9	58	174
Lower Talarik Creek	4	8	55	148
Upper Talarik Creek	3	5	16	48
Chekok Creek	2	7	19	46
Area T				
Nushagak River – Sonar Site to Outlet of Mulchatna	4	28	1,153	3,577
Nushagak River – Black Point upstream to Sonar Site	4	21	847	2,513
Mulchatna River	4	6	135	342

Sources: Sigurdsson and Powers 2012, 2013, 2014; Powers and Sigurdsson 2016

[12] Duffield et al. (2007) and EPA (2014) defined a trip as "a roundtrip visit from home and return." Given the region's remoteness, this definition means that most trips involve multiple days of activity. Remote fishing lodge packages typically range from 3 to 7 days.

Table 3.6-14: Inflation-Adjusted Estimates of per Trip Expenditures

Category	Watershed Residents	Alaska Ex-Watershed	Non-Residents	Remote Lodges
Estimated per Trip Expenditures	$426	$1,806	$4,560	$7,933
Average Trips per Year	11.54	1.30	1.49	N/A

Notes:
N/A = not applicable
Expenditures adjusted using Anchorage CPI.
Source: EPA 2014.

The inflation-adjusted collective expenditures in Duffield et al. (2007) associated with recreational fishing in the Bristol Bay region equal $5.5 million by watershed residents, $6.9 million by Alaska residents living outside the region, and $54.1 million by non-residents, for a total of $66.58 million (Table 3.6-15). The inflation-adjusted estimate of statewide expenditures from Duffield et al. (2007) is $69.32 million; therefor, most angler expenditures occur in-region.

Table 3.6-15: Inflation-Adjusted Estimates of In-Region Expenditures

Category	Watershed Residents	Alaska Ex-Watershed	Non-Residents	Total
Estimated Bristol Bay Expenditures	$5,564,568	$6,910,211	$54,108,115	$66,582,894

Note: Expenditures adjusted using Anchorage CPI
Source: EPA 2014.

In 2005, the year used as the basis for the Duffield et al. (2007) expenditure estimates, the ADF&G SWHS estimated 75,083 angler days in SWHS areas S and T. In 2016, the same survey estimated 54,882 angler days in the region, a decline of 27 percent. For the 5-year periods of 2001 through 2005 and 2012 through 2016, effort was down 15 percent from the earlier period to the later period, as shown in Table 3.6-16. Presuming that angler expenditures have stayed the same adjusted for inflation, the decline in effort would result in a reduction in regional expenditures. A 27 percent adjustment applied to the Duffield et al. (2007) estimate of $66.58 million results in an estimate of $56.54 million in regional expenditures for 2016, presuming that the distribution of angler expenditures has remained constant.

Table 3.6-16: Comparative Estimates of Sport Fishing Effort, Days

SWHS Area	Annual Counts		Five-Year Averages	
	2005	2016	2001-2005	2012-2016
Nushagak	48,751	27,786	41,670	32,807
Kvichak	26,332	27,096	26,460	25,043
Total	**75,083**	**54,882**	**68,130**	**57,851**

Note:
SWHS = Statewide Harvest Survey
Source: ADF&G 2018d

3.6.3.3 Local Recreational Fishery Fiscal Contribution

Anglers can contribute to the fiscal resources of local governments through taxes such as sales (City of Dillingham) and lodging (LPB, City of Dillingham, Bristol Bay Borough). The LPB also raises revenue through a direct tax on guide services under which guides pay $3 per angler day to the borough.

In fiscal year 2018, the LPB generated $56,282 from 147 guides licensed to work in the borough and $177,566 from 64 lodges in the borough. These amounts are equal to roughly 6.8 percent of all LPB tax revenue, and 4.6 percent of all fiscal year 2018 revenue (Table 3.6-17) (LPB 2018b).

The Bristol Bay Borough, which does not have a guide tax, does have transient occupancy (i.e., bed) tax revenues and real property tax revenues associated with lodges. It is very likely that these revenues are a small subset of the borough's $4.9 million in annual property tax revenues, given that fish processing facilities likely make up the bulk of the borough's tax base (Table 3.6-17).

Table 3.6-17: Lake and Peninsula Borough Recreational Fishing Revenues

Fiscal Year	Annual Revenues	
	Guide Tax	Bed Tax
2015	39,716	262,831
2016	46,030	180,069
2017	30,948	108,895
2018	56,282	177, 566

Source: LPB 2018b

3.6.3.4 Saltwater Fishing in Cook Inlet

The EIS analysis area includes the saltwater fishing environment. ADF&G's SWHS estimates that, on average, anglers generate approximately 180,000 saltwater fishing days in Cook Inlet. A 2008 study by the ADF&G found that these anglers spend an average of approximately $245 per angler day (both fresh and saltwater). The study estimated total direct saltwater expenditures at slightly more than $99 million in 2007 (ADF&G 2018d).[13]

Fishing effort SWHS data break down into three large groups and one smaller group of anglers. These are:

- **Boat anglers inside of Kachemak Bay, as defined by a line running from Bluff Point to Seldovia**—Average efforts in this area, based on 2008 to 2017 data, equal just under 59,000 days per year, or 33.2 percent of the area total. Effort in this area is predominantly by non-charter anglers, with charter anglers accounting for 28 percent of days between 2008 and 2017.
- **Boat anglers fishing north of a line which runs from Bluff Point between Homer and Anchor Point and Chinitna Point in West Cook Inlet**—This area includes popular saltwater launch and fishing locations such as Anchor Point, Happy Valley, Deep Creek, and Ninilchik. Efforts in this area average 58,000 days between 2008 and 2017, or 32.3 percent of the area total. The ADF&G estimates that 47 percent of these days are by charter anglers.

[13] The study did not estimate an expenditure per day figure for saltwater angling in Cook Inlet.

- **Boat anglers south of the Bluff Point/Chinitna Point line and west of Gore Point on the outside of the Kenai Peninsula**—This area averages 44,600 days per year, or 25 percent of the area total; 58.6 percent of the angler days in this area are charter angler days. This area includes Kamishak Bay and much of the natural gas pipeline route through Cook Inlet.
- **Shore Anglers and Boat Day of Unspecified Location**—This category averaged 17,000 days per year between 2008 and 2017, or slightly less than 9.5 percent of total effort. More than 95 percent of this effort is shore-based, and nearly three-quarters of this category's effort occurred at the Homer Spit.