Preliminary Investigation of Economic Impacts Related to Proposed Critical Habitat Designation for Cook Inlet Beluga Whale

Prepared for:

Resource Development Council for Alaska, Inc.

Submitted by:

Resource Dimensions
Multidimensional Economic Analysis • Sustainability Planning
Land Use • Policy Analysis • Regulatory & Litigation Support

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**This investigation, analysis, and report are subject to important conditions and assumptions that affect our findings and conclusions. As applicable, we have identified data gaps or a lack of supporting documentation throughout the report. The reader should review all limiting conditions and assumptions in this report before utilizing or relying upon the findings and conclusions.*

[†] *The State of Alaska contributed financial support to the preparation of this report.*

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List of Acronyms

BLS	Bureau of Labor Statistics
CBA	Cost benefit analysis
CHD	Critical habitat designation
CIR	Cook Inlet region
ESA	Endangered Species Act
IMPLAN	IMpact Analysis for PLANning
IO	Input/output model used to depict relationships in the regional economy
LNG	Liquefied natural gas
MHHW	Mean Higher High Water
NAICS	North American Industry Classification System
NMFS	National Marine Fisheries Service
PCE	Primary constituent element
RIR	Regulatory Impact Review
WTP	Willingness-to-pay

Executive Summary

Introduction

The purpose of this report is twofold.

First, this report provides a critical review of the draft economic analysis issued as part of the National Marine Fisheries Service's (NMFS's) *Draft Regulatory Impact Review (RIR)/Section 4(b)(2) Preparatory Assessment/IRFA for the Critical Habitat Designation of* the *Cook Inlet Beluga Whale* (Nov. 17, 2009) (hereinafter "Draft RIR").

Second, this report provides an analysis of the potential economic impacts associated with the designation of critical habitat for the Cook Inlet beluga whale. Specifically, our analysis examines the potential economic impacts to a broad range of industries operating within or adjacent to the area that NMFS proposes to designate as critical habitat. This report also includes an analysis of those industry related impacts and potential secondary impacts in the regional and state economy.

Approach

This report looks at two possible scenarios that may result from critical habitat designation (CHD). The Scenario 1 (status quo) analysis establishes a baseline in economic activities, and assumes no designation of critical habitat. The Scenario 1 in our analysis is equivalent to Scenario 1 as contained within the NMFS Draft RIR report.

Scenario 2 assumes designation of both Area 1 and Area 2 (Figure 1), as proposed by NMFS on December 2, 2009. Consequently, this considers impacts on five key industries (oil and gas, mining, the Port of Anchorage, commercial fishing, and sport fishing).

By comparing Scenario 2 to the status quo (Scenario 1), this study estimates the economic impacts associated with CHD. Our investigation included gathering information from the State of Alaska, private industry, municipalities, nonprofit organizations, and a cross-section of Resource Development Council for Alaska, Inc. (RDC) members on likely impacts to operations and services and their costs attributable to CHD. Data was collected through personal and phone interviews, and a questionnaire that was available in two electronic formats (online and interactive PDF file). See Appendices A, B.

Based on that data, which is consistent with economic analyses conducted for several other critical habitat designations (Section 2.IV. below), we determined that the CHD might have a range of impacts on these industries. The data collected conservatively support a production loss for these industries because of critical habitat costs of at least 1% with the possibility that the production loss could range as high as 10%.

To capture this potential range, we estimated the potential economic loss from the CHD for Scenario 2 using three different values: a 1% loss production, a 5% loss in production, and a 10% loss in production. The justification for these numbers is discussed in detail below in Section 2.IV. These numbers represent a conservative estimate of the cumulative potential economic impact. As discussed below, these monetized economic impacts do not include those economic impacts that may occur if projects – such as the Knik Arm

Toll Bridge project – are abandoned because of CHD restrictions. Although these other potential impacts are not included within the numeric results, they are discussed qualitatively where appropriate.

Results

Under Scenario 1 (status quo), total production associated with the affected industries including secondary effects is $4.0 billion of output, with $3.0 billion of this amount representing current production and $999.4 million representing potential future production from mining. Under Scenario 2 (CHD for Area 1 and Area 2), the loss in total annual impacts based on annual production estimates attributed to the designation of critical habitat ranges from $39.9 million to $399.0 million depending on whether the loss in production is 1%, 5%, or 10%.

Under Scenario 1 (status quo), total labor earnings associated with the affected industries including secondary effects is $956.9 million, with $717.3 million of this amount representing current labor earnings and $239.5 million of this amount representing potential future labor earnings from mining. Under Scenario 2 (CHD for Area 1 and Area 2), the loss in total labor earnings ranges from $9.6 million to $95.7 million depending on whether the loss in production is 1%, 5%, or 10%.

The losses throughout this report represent the estimated annual losses to the Cook Inlet region (CIR). These losses could continue throughout the 10-year period considered in the Draft RIR. To account for this, the present value of the losses was calculated for the 10-year period. To evaluate using a similar framework to the Draft RIR analysis, discount rates of 3% and 7% were used. The results indicated that in terms of reductions in direct output the estimated loss ranged from $224.6 million to $2.2 billion at the 1% to 10% reductions with a 3% discount rate and from $184.9 million to $1.8 billion at the 1% to 10% reductions with a 7% discount rate.

In terms of total output, the results indicated that the estimated loss ranged from $340.4 million to $3.4 billion at the 1% to 10% reductions with a 3% discount rate and from $280.2 million to $2.8 billion at the 1% to 10% reductions with a 7% discount rate. In terms of total labor income, the results indicated that the estimated losses ranged from $81.6 million to $816.2 million at the 1% to 10% reductions with a 3% discount rate and from $67.2 million to $672.1 million at the 1% to 10% reductions with a 7% discount rate.

SECTION 1: Comments on the National Marine Fisheries Service Draft Economic Analysis of Critical Habitat Designation for the Cook Inlet Beluga Whale

I. Overview

Provided below are a number of comments and concerns we identified with the Draft RIR. As discussed in detail below, we have only minor concerns with the cost/benefit framework selected by NMFS. However, we have major concerns related to the values applied to that framework. Principally, we believe that the Draft RIR significantly underestimates the costs associated with the designation of critical habitat. The data we have collected (as discussed below in Section 2 of this report) demonstrate that NMFS overlooks much of the costs associated with the designation.

At the same time, NMFS significantly overestimates the benefits of the designation of critical habitat. NMFS's benefit analysis is premised on "*A potential change in the quality or condition of the CH that is an improvement over the expected condition of the habitat absent CHD*," (page 5-1). Yet nowhere does the Draft RIR cite data that would support a conclusion that this "*potential*" will be realized at all for this critical habitat designation (CHD). Without any factual basis to support that underlying premise, the benefits of the designation are speculative and hypothetical. Given that these benefits are essentially conjectured, the report has no proper basis to conclude, "*The anticipated benefits outweigh the anticipated costs*" (page 8-1).

Specific comments are provided below.

II. General/Methodological

There are two main approaches available to fulfill the requirements for an economic analysis of a proposed environmental policy: cost benefit analysis (CBA) and regional economic impact analysis (IO). Both approaches are well grounded in current economic foundations. CBA is a technique that attempts to address the question of whether a policy proposal is a net gain to society by using a monetary measure of change as a metric in society's well-being. A benefit cost ratio of significantly greater than one suggests that the policy is a net gain to society (for a complete discussion on the state of the art and science of CBA see Kopp, Krupnick, and Toman [1997]). The authors of the Draft RIR model use a CBA framework. They attempt to measure the cost-benefit framework as the benefits of CHD versus costs of changes in production and other uses. IO Impact analysis using input-output models are a more common approach to environmental impact analysis and is the standard tool for the majority of environmental policy related economic impact work done. The modeling framework is data intensive and involves creating a model of the entire regional economy. IO

attempts to measure changes in output because of an environmental policy proposal. It does not attempt to estimate whether the policy is an optimal move for society. It estimates regional job and income impacts and leaves the decision up to policy makers or managers as to whether the policy is socially optimal. All approaches have limitations unique to the methodology and IO is no different. The following presentation identifies what we consider the major problems of the Draft RIR in following CBA.

First, we believe that the period employed for the CBA, 2009 to 2018, may be insufficient, particularly when dealing with significant resource and community infrastructure operations and development. Firms in these industrial sectors must balance disparate time horizons for capital life, field life, field extension, and field depletion rates that are rarely as short as 10 years.

It also appears that an insufficient range of alternatives is proposed for analysis. In effect, the alternatives are an all or nothing approach. In most policy impact assessments of this nature, it is prudent for the Agency to assure consideration and impact valuation for a range of alternatives. The Draft RIR should include at least one intermediate alternative that involves less than the entire area designated.

Detailed description of problems in the CBA method used in the Draft RIR report follows.

III. Costs

Perhaps because the Draft RIR considers potential changes resulting from critical habitat almost solely from the perspective of how the agency might wield its new regulatory authority, the Draft RIR significantly underestimates costs of CHD in a number of important ways. First, the only definitive "costs" identified in nearly all industrial sectors discussed in the report are direct consultation costs, meaning the incremental time and effort associated with undertaking a critical habitat analysis as part of an Endangered Species Act (ESA) Section 7 consultation or the entire cost of a consultation when designation triggers "reinitiation" of consultation. No other costs are considered. The use of "consultation costs" as the only measure of costs to industry is insufficient. Such actions might be considered transaction costs leading to an imposed or agreed upon change in policy or action, but it is still the economic results of the action that are of primary importance in this effort. The real question is whether designation of the critical habitat will affect output in commodity-based industries and service provision in the service sector linked to uses of the area. To properly employ the benefit-cost methodology the analysis must actually estimate changes in these competing uses.

This sole focus on consultation costs is apparent even where the Draft RIR discusses compliance costs. Section 7.15 of the Draft RIR indicates, *"These costs stem from Section 7 consultations, outlined in Section 7.1 to 7.14"* (page 7-11). By focusing strictly on consultation costs, the analysis ignores other compliance costs such as: 1) Monitoring Requirements, 2) Project Slippage, 3) Loss of

Production, 4) Uncertainty, 5) Non-Market Costs, and 6) Project Modification Costs. Although Section 4.1.2 discusses Project Modification Costs (p. 4-3), these costs do not appear to have been included in the analysis. Due to the omission of many potential opportunity and compliance costs, the analysis provided in the Draft RIR significantly understates the true cost of CHD.

Even if the agency had properly considered compliance costs, these costs alone do not account for the total economic impact of the CHD. Section 3.2.1 of the report indicates that… "*In some instances, compliance cost may provide a reasonable approximation of the economic burden associated with regulatory action*" (p. 3-3). However, as noted by Shogren (2009), the economic burden associated with regulatory actions goes far beyond compliance costs:[1]

> "*The best measure of economic loss is opportunity cost – the foregone opportunities due to restrictions on the use of property due to listing designation of critical habitat, and recovery plans. Opportunity costs include the reduced economic profit from restricted or altered development projects including agriculture production, timber harvesting, mineral extraction, and recreation activities; wages lost by displaced workers who remain unemployed or who are re-employed at lower pay; lower consumer surplus due to higher prices; and lower county property and severance tax revenue.*"

Most of these opportunity costs could apply to CHD but were not considered in the Draft RIR.

The Draft RIR also overlooked other potential costs, sometimes identifying those potential costs as benefits. For example, Section 5, Identifying Benefits (p. 5-1), explains that *"The close proximity of Cook Inlet beluga whale CH to Alaska's largest population centers (Anchorage, Homer, Mat-Su Valley, and Kenai Peninsula), as well as Native Alaska communities, suggests potential for significant benefits to accrue to the local population and tourists"*. However, the Draft RIR overlooks the fact that the very same close proximity to the largest population centers can also result in the potential for significant costs to society and the Alaskan economy.

Section 6.4.1 (p. 6-26) states "*Southcentral Alaska depends heavily upon Cook Inlet natural gas.*" This suggests that consideration of the opportunity costs of alternative sources of energy should have been included in the analysis. They were not.

Finally, in most cases where minerals and petroleum are involved, important components of projecting impacts are state and local government fiscal impacts. Mineral industries are usually well connected through state and local taxing mechanisms in the provision of

[1] Shogren, Jason. Stroock Professor of Natural Resource Conservation and Management, University of Wyoming, Department of Economics and Finance Personal Communication, December 2009.)

public services. These services can be as important or more important in determining the quality of life and overall economic development than amenities are. In fact, very often it is the "produced" public goods generated by taxes that are seen as a tradeoff with natural amenity public goods. Therefore, it is critical in policymaking that can affect mineral development to include both economic and fiscal effects in an analysis.

Changes in commodity outputs can change tax revenues, which often change the provision of public services. The authors estimate costs from "consultations" as opposed to changes in output or activities. If the result of the "consultation" is changes in activities then tax revenues driven by those activities could change.

IV. Benefits

The Draft RIR's benefits analysis suffers from a number of significant shortcomings. As noted above, the entire benefits analysis rests on the premise that the Cook Inlet beluga whale CHD has the "potential" to improve conservation of the Cook Inlet beluga whale and its critical habitat (page 5-1). The Draft RIR refers to this incremental change as the "Hypothetical Avoided Degradation because of CHD" (Figure 3-2, page 3-8). Based on that *hypothetical* avoided habitat degradation, NMFS proceeds to identify a number of "potential" benefits many of which are centered on enjoyment or benefit from a "*more pristine environment*" (page 7-3). For example, the Draft RIR notes that the oil industry may benefit from a designation because employees "*May be willing to work in the area because of the natural beauty, environmental quality, and outdoor recreation opportunities available*" (page 7-2).

The core problem with all purported benefits based on hypothetical avoided habitat degradation is that NMFS has no data or analysis to support a conclusion that this habitat designation will result in any kind of measurable habitat benefits. On the contrary, the Draft RIR concedes, "*none of these types of benefits has been studied in direct association with the CHD for the Cook Inlet beluga whale*" (page 5-13). As such, these benefits are purely speculative, if not irresponsible, and cannot be given any weight in any cost benefit analysis.

Nor is this the only reason why the benefits of CHD are overstated in the Draft RIR. Sections 9.2.1.1 (p. 9-4) indicates that CHD for Area 1 critical habitat is "*anticipated to contribute significantly to the conservation and recovery of the Cook Inlet beluga whale, above all else".* However, no information is reported regarding the extent of habitat degradation in Cook Inlet. According to NMFS, the decline in the Cook Inlet beluga whale population is attributable to overharvesting, not degradation of the whale's habitat.[2] Since there

[2] 72 Federal Register 76, pp. 19,854; 19,862, (April 20, 2007). Proposed final rule, Endangered Status for the CIBW. "*The subsistence removal reported during the 1990s are sufficient to account for the decline observed in the population,*" (p. 19,859). "*No information exists that beluga habitat has been modified or curtailed to an extent that is*

appears to be no evidence that habitat quality is a limiting factor to recovery, the economic benefits of CHD are likely to be minimal to nonexistent, particularly in light of the other regulations already in place.

Even if there were data or analysis to support a finding that the CHD will make an increasingly pristine environment in Cook Inlet, many of the benefits the Draft RIR attributes to that increased habitat preservation are still entirely speculative. For example, Sections 9.2.1.1 and 9.2.2.1 (pp. 9-4, 9-5) indicate that both Area 1 and Area 2 CHD will contribute to retention of the natural attributes of Cook Inlet making the region more attractive to workers due to enhanced quality of life. Given the wide array of natural attributes already available in the region, it is unlikely that CHD would measurably increase the attractiveness of the area in terms of increased quality of life for most workers beyond its current level (which is probably quite high for workers motivated by natural attributes). Moreover, this approach alludes to compensating differential estimates along the lines of Greenwood, et al (1991), which finds that workers will accept a lower wage in areas with high amenities. Such a claim would need to be evaluated and estimated, not assumed.

These same sections intimate that both Area 1 and Area 2 CHD are "*anticipated to provide higher valued experiences to tourists, recreationists, whale watchers, Cook Inlet Ferry passengers, and future cruise ship passengers. Such improvements would, in turn, result in higher revenues for relevant businesses,*" (p. 9-4). However, elsewhere in the report it is noted that:

- "*Recreation and tourism activities occur throughout Cook* Inlet*, but, with the exception of sport fishing are primarily land-based activities…..Most sport fishing in the Anchorage area is located in the freshwater rivers flowing into Turnagain Arm and Knik Arm, with relatively little saltwater fishing in Cook Inlet.*" (Section 6.4.11, p. 6-84).

- "*Recreation and tourism activities in the Cook Inlet, near Anchorage, are primarily limited to small, personal use boats…..Representatives from the Alaska Chamber of Commerce, as well as a private tour operator, knew of no commercial boat tours offering whale watching or guided fishing in the Anchorage area…..Due to the extreme tidal flows and shallow mudflats, boat tours do not travel the Turnagain Arm or Knik Arm. While many cruise passengers visit Anchorage as a point of arrival or departure, most cruise ships dock at Seward, and passengers travel overland to Anchorage, via tour bus, along Turnagain Arm.*" (Section 6.4.11, p. 6-85).

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likely to have caused the population decline observed within Cook Inlet," (p. 19,858). 73 Federal Register 205, pp. 62,919-62,930, (October 22, 2008). Final rule, Endangered Status for the CIBW. "*We have no data at this time to indicate that carrying capacity has decreased,*" (p. 62,921).

- "*Marina and access to boat launch sites are very rare in the Anchorage area*." (Section 6.4.11, p. 6-85).

- "*Visitors [to Homer] do not participate in dedicated whale watching excursions, due to the long distance necessary to travel to ensure a whale sighting. In 2009, Homer's only whale watching boat switched to offering more generalized wildlife viewing within Kachemak Bay, rather than making the journey to Barren Islands to guarantee a whale sighting.*" (Section 6.4.11, p. 6-86).

- "*Currently there is no special Cook Inlet whale management in the State-managed wildlife areas.*" (Section 6.4.11, p. 6-86).

- "*There are no known plans for expansion or development of recreation or tourism-related facilities on Cook Inlet.*" (Section 6.4.11, p. 6-89).

Given the above description of recreation and tourism in Cook Inlet, it seems unlikely that CHD will result in higher revenues for relevant businesses due to the lack of relevant businesses in the first instance. Defining critical habitat for beluga whales does not mean that recreationists will come to Cook Inlet. If tourists are not already there, adding regulatory burdens will do little to encourage more use.

Other issues include relevant regional delineations and unclear conclusions, for example:

- Distributional and regional economic effects are not quantified in the report.

- Section 3.2 explains that the distributional effects that may result from CHD have been considered. However, the distributional effects do not appear to be quantified in the analysis. This could have been done by analyzing the economic impact of incremental changes in economic activities such as sport fishing or whale watching relative to other economic activities such as oil and gas production and mining using a regional input/output (IO) model. This would have informed how CHD could affect the various sectors of the regional economy incrementally in terms of gainers and losers. It would have also informed the relative economic impacts of different economic activities.

- The logic for the conclusions in Section 8 is unclear. If they had actually estimated benefits and costs then the estimates relevant for the region are approximately the same as for the Nation. Conversely, if they had estimated regional impacts through IO methods then the national benefits and costs would have been greater in magnitude (either negative or positive)

since all economic linkages are accounted for when the size of a region is increased from local to national. Since neither was done and no benefits and costs were estimated, the purpose of the section is unclear.

- The assumption in the note for Table 7-1 (p. 7-12) needs clarification. Most likely, there is not an equal probability of Section 7 consulting costs occurring over the specified range of time, given drastically different project timelines and time horizons for differing industries.

- Given that "*It is not possible to provide quantitative estimates of all the projected benefits that may be uniquely attributable to the designation of CH for Cook Inlet beluga whale*," how is it possible to conclude that "*if these benefits were somehow to be quantified and monetized, the anticipated benefits outweigh anticipated costs,*" (Section 8, p. 8-1)? It is also unclear how this conclusion supports the statement "*NMFS is of the opinion that the proposed Cook Inlet beluga whale CHD can be expected to result in a net benefit to the Nation.*" These statements are muddled due to the imprecise nature of non-market valuations. As noted in Appendix A, "*In 2006 dollars, the annual household values for threatened and endangered species from the updated set of 29 studies ranged from $11 to $350*," (Appendix A, p. A-9). It is apparently unknown where Cook Inlet beluga whales fall within this range. Further, we find implausible the assertion that all effort has been made to comprehensively identify (and, wherever possible, to quantify or monetize) benefits and costs associated with CHD (Section 8, p. 8-1).

- Given the methodological shortcomings of the report, the conclusion that costs are exceeded by benefits is to be expected. It is not possible to know if the conclusion that only the Eagle River Flats Impact Area of Fort Richardson should be excluded from CHD is the correct conclusion, given a lack of quantification and ignorance of all relevant costs and benefits (Section 9.2.13, p. 9-5).

- The Draft RIR does not clarify that there will be an increase in the economic benefits that accrue to residents of Cook Inlet from CHD. At best under Scenario 1 (status quo), it can be argued that economic benefits will be maintained. All values researched and itemized were determined prior to listing of the Cook Inlet beluga whale as an endangered species. No rationale is provided as to why CHD would enhance the economics values and lead to an increase in any monetized values. If anything, the various benefits listed may be at risk because of potential restrictions put on existing business practices to safeguard the Cook Inlet beluga whales within Cook Inlet.

- Section 5.4.5 (p. 5-12) suggests that the value of volunteer work can be estimated based on the value of foregone wages. However, this assumes additional hours of employment are available, which often is not the case for a variety of reasons.

- There are limitations on what the analysis accomplished in terms of quantifying benefits of CHD. While identifying the sources of use and non-use values, the authors do not attempt to estimate actual value of the entire fishery including halibut and salmon. It is important to consider what the body of literature asserts about magnitudes of willingness-to-pay (WTP) and expenditures, but the authors should have actually estimated the actual fisheries value. These estimates are typically derived through primary data approaches or through secondary methods with benefits transfer methods. For example, how many people are whale watching or fishing in critical habitat? What is the best estimate of the value of whale watching, and how was that estimate calculated? On what study are the authors indexing their analysis, and why?

- Moreover, with respect to special populations such as Alaska Native communities and subsistence fishermen, to what extent are they dependent, directly and indirectly, upon jobs by the industries that could be negatively affected by production stoppage or slowdowns due to NMFS demands? This is an empirical question that must be included in the calculus of benefits (and opportunity costs) to Alaska Native communities. Alaska Native communities might benefit from enhancements in the fisheries (at the expense of other groups) but they also benefit from well paying jobs. The degree to which this is a cost or benefit is an empirical question, and a question not answered in the draft.

- Throughout Section 7 of the Draft RIR the authors suggest significant potential benefits of CHD to: 1) Oil and Gas Development, 2) Mining, 3) Transportation, 4) Port Expansion and Development, 5) Other Large-Scale Development/Infrastructure Projects, 6) Water Quality, 7) Power Projects/Development, 8) Commercial Fisheries, and 9) Native Alaskan and Subsistence Use, 10) Alaska Residents Personal Use Fishery, 11) Recreation and Tourism, and 12) Military Activities. Yet, justification and supporting references are lacking for the numerous statements that CHD may benefit most, if not all, of the sectors considered in this section. However, Section 2.3 (p. 2-4) indicates that every one of the activities listed above "*have the potential to pose conservation threats to the Cook Inlet beluga whale and its habitat*". Given this potential as a threat, the net effect of CHD on these activities could in fact be negative for many activities because of the potential of reduced use.

V. Conclusions

In summation, the economic analysis within the Draft RIR is inadequate to sufficiently inform the public policy debate on Cook Inlet beluga whale CHD. The Draft RIR is particularly lacking with respect to quantifiable estimates of benefits and costs and specific impacts in the region. To meet acceptable professional standards on which all can rely, there must be a concrete and quantifiable estimate of economic and fiscal impacts or benefits and costs to the region and the Nation. To do this there needs to be a thoroughly vetted set of proposed rules that govern what could be done in areas of concern.

To make this analysis relevant for residents and businesses in the region, impacts need to be estimated based upon those rules. The region needs to include the Municipality of Anchorage, the Matanuska-Susitna Borough, the Kenai Peninsula Borough, Alaska Native communities, industry, and users.

SECTION 2: Preliminary Analysis of the Potential Economic Impacts on Industry, the Region and the State of Alaska from Critical Habitat Designation for the Cook Inlet Beluga Whale

I. Purpose

Section 2 considers the economic importance of industries in the Cook Inlet region (CIR) of Alaska that could be affected by CHD for the Cook Inlet beluga whale. For this analysis, the CIR is defined as the Municipality of Anchorage, the Kenai Peninsula Borough, and the Matanuska-Susitna Borough. Economic importance was measured in terms of economic impact that considers the estimated jobs and income generation by the affected sectors both directly in the affected industries and secondarily in support industries. Secondary impacts represent economic linkages between the affected sectors and other sectors of the region's economy. The economic impact analysis is used to provide a perspective on the relative importance of these industries to the regional economy.

II. Limitations

As with all socio-economic research, the results presented in this report have some limitations that reflect the trade-off between available study resources (time, funding, etc.) and study rigor and robustness, and thus accuracy. The principal goals of the project have been met under a compressed timeframe necessitated by NMFS's public comment period deadline, which presents the most significant limitation.

While this analysis is not comprehensive, it does quantify some of the specific costs that may be imposed and details their potential magnitude given the proposed designation of critical habitat for the Cook Inlet beluga whale specified by NMFS. To facilitate a framework for analysis, two scenarios were developed, each of which required a series of assumptions. These are noted to the extent practicable throughout this report. We did not calculate the effect of CHD on the national economy.

Finally, we regret that we have not been able to incorporate all of the valid qualitative data that we had gathered; however, we believe that we have discussed the most pertinent of this information throughout this document. The fact that such data was not incorporated does not undermine the quantitative analysis or the conclusions drawn.

III. Introduction

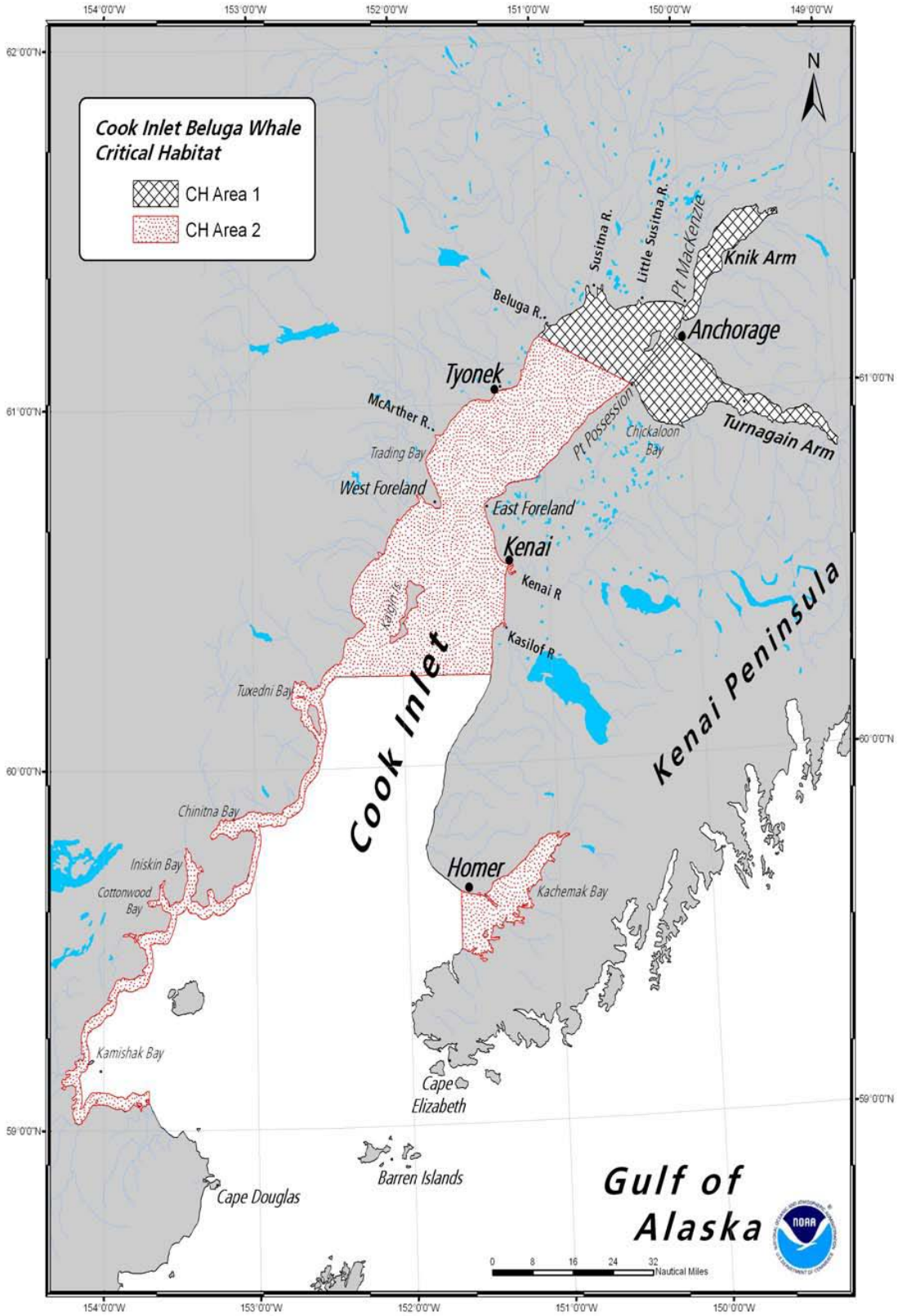
Overview of the Critical Habitat

The proposed rule would encompass approximately 3,016 square miles of marine habitat in Cook Inlet, located in Southcentral Alaska. All marine waters of Cook Inlet north of a line from the mouth of Threemile Creek (61° 08.5' N., 151° 04.4' W.) connecting to Point Possession (61° 02.1' N., 150° 24.3' W.), including waters of the Susitna River south of 61° 20.0' N., the Little Susitna River south of 61° 18.0' N., and the Chikaloon River north of 60° 53.0' N., are referred to as Area 1. Area 2 is comprised of all marine waters of Cook Inlet south of a line from the mouth of Threemile Creek (61° 08.5' N., 151° 04.4' W.) to Point Possession (61° 02.1' N., 150° 24.3' W.), including waters within 2 nautical miles seaward of Mean Higher High Water (MHHW) along the western shoreline of Cook Inlet between 60° 25' N. and the mouth of the Douglas River (59° 04' N., 153° 46.0' W.); all waters of Kachemak Bay east of 151° 40.0' W.; and waters of the Kenai River below the Warren Ames bridge at Kenai, Alaska. These are the regions of interest to which this assessment pertains, which is proposed to be designated as the critical habitat for the Cook Inlet beluga whale (Figure 1).

In the analysis below, we identify the range of potential and/or anticipated impacts to the level of economic activity associated with the proposed rule change, and the resulting direct and indirect economic impacts to entities deriving revenue directly or indirectly from Cook Inlet and the businesses they support. This, however, cannot be examined without some understanding of the regional economy, and its concentrated reliance on goods and services, particularly because Cook Inlet is the major thoroughfare for these items to the State of Alaska.

Our conclusion is that the individual magnitude of impacts from CHD are substantial to the industry sectors we have studied, and the compounded direct and indirect impacts on the regional economies will be large enough to affect the extent of the proposed area for inclusion. Of particular concern is the nature of various impacts associated with the regional economy, and the businesses that support and rely on it.

Figure 1. Cook Inlet Region with Proposed CHD Overlay.



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Source: 74 Federal Register 230, December 2, 2009, page 63094.

Snapshot of the Regional Economy

Employment and Labor Force

The United States Census Bureau, 2006-2008 American Community Survey, estimated a civilian labor force (population greater than 16) of 151,538 for the Municipality of Anchorage, 27,374 for the Kenai Peninsula Borough, and 41,475 for the Matanuska-Susitna Borough (United States Census Bureau, American Community Survey 2008). The civilian labor force for the State of Alaska was estimated to be 361,306 by this same survey, thus the CIR accounts for roughly 61% of Alaska's civilian labor force. Based on the 2006-2008 American Community Survey and the 2000 United States Census the civilian labor force has increased 16.7%, from 309,485 workers in 2000. This trend is mirrored by the population growth rate of 14.1% for Alaska in the same period, for people 16 and older (458,054 to 522,829).

As shown in Table 1, the greatest number of business establishments in the CIR are those typically falling within that of the service sector, accounting for about 52% of all area business establishments as reported and defined by the North American Industry Classification System (NAICS) business code classification system (Alaska Department of Labor and Workforce Development 2009).[3]

In Table 1, several incomplete data fields were not completely reported in the source data, for which we used the present figure. These fields are Kenai Peninsula Borough – Agriculture, Fishing, Forestry, and Hunting, and Matanuska-Susitna Borough – Utilities and Wholesale Trade.

[3] The NAICS was developed jointly by the United States, Canada, and Mexico to provide comparability in statistics about business activity across North America.

Table 1. Business patterns of the study region, by NAICS code.

Industry Code	Industry Code Description	Anchorage	Kenai Peninsula Borough	Matanuska-Susitna Borough	Cook Inlet Region	State
11----	Agriculture, Forestry, Fishing and Hunting	78	27	69	174	775
21----	Mining (including Oil & Gas)	2904	1174	47	4125	15162
22----	Utilities	536	256		792	1893
23----	Construction	9132	985	1648	11765	17262
31-33---	Manufacturing	1897	1022	281	3200	12986
42----	Wholesale Trade	4748	227	123	5098	6537
44-45---	Retail Trade	17448	2500	3429	23377	36228
48-49---	Transportation and Warehousing	10849	794	814	12457	20175
51----	Information	4384	259	646	5289	6996
52----	Finance and Insurance	5557	306	414	6277	8955
53----	Real Estate & Rental and Leasing	3431	223	314	3968	5884
54----	Professional, Scientific, and Technical Services	9598	276	527	10401	13184
56----	Admin, Support, Waste Mgt, Remediation / Mgt of Companies and Enterprises	7921	242	285	8448	13038
61----	Educational Services	1257	81	328	1666	2099
62----	Health Care and Social Assistance	18813	1877	2692	23382	35486
71----	Arts, Entertainment & Recreation	1968	367	350	2685	4509
72----	Accommodation & Food Services	13714	2109	1983	17806	27674
81----	Other Services (except Public Administration)	5964	808	626	7398	11076
99----	Public Administration	29853	5116	3819	38788	80932

Source: Alaska Department of Labor and Workforce Development, 2009.

Demographic Trends

The population of the CIR comprises about 61% of the total population of Alaska, and average income per capita is slightly less than that of the state. For the CIR and Alaska, males comprise 51% and 52% of the population, respectively, compared to 49% for the United States. The Municipality of Anchorage has a significantly higher average income per capita than the two boroughs, Alaska, and the Nation (United States Census Bureau, American Community Survey 2008).

The Kenai Peninsula Borough has a markedly high percentage of residents that are high school graduates, propelled by factors such as smaller class sizes, greater spending per student, and greater access to guidance counselors than either Anchorage or the Matanuska-Susitna Borough (Personal communication with Alaska Department of Education and Early Development and public school districts, February 2010). However, Anchorage has a higher concentration of residents with bachelor and graduate degrees, which are probable contributors to its increased wealth.

Unemployment rates vary drastically across the three areas of the CIR. The unemployment rate of Anchorage is less than that of both Alaska and the United States. As a result, the unemployment rate of the CIR is slightly lower than that of Alaska. The Kenai Peninsula Borough and the Matanuska-Susitna Borough have significantly higher unemployment rates than the State and Nation. Future job growth for Alaska is expected to dampen slightly, driven mainly by losses in the construction sector (Rae 2009).

Only Kenai Peninsula Borough residents pay a sales tax, which varies between two and three percent (Alaska Department of Commerce, Community and Economic Development 2008). The cost of living is essentially equal through the CIR (Fried and Robinson 2009).

The reason for briefly exploring some demographic trends in this section (income per capita, population density, education levels) is that they all have significant bearing on both the economy of the CIR and on the economy of Alaska. Table 2 provides various comparative demographic statistics for Anchorage, the Kenai Peninsula Borough, and the Matanuska-Susitna Borough against the CIR, Alaska and the Nation. In the following section, we discuss the specific components of the economies assessed in relation to CHD for the Cook Inlet beluga whale.

Table 2. Anchorage and Borough demographics compared to the CIR, Alaska, and the Nation.

Population Characteristics	Anchorage	Kenai Peninsula Borough	Matanuska-Susitna Borough	Cook Inlet Region	State	Nation
Population	278,716	52,870	82,485	414,071	681,235	301,237,703
Population Density	164.2	3.3	3.3	56.9	1.2	85.2
Percent Male	50.90%	52.80%	52.30%	52.00%	52.10%	49.30%
Median Age	33.4	38.3	33.4	35	33.4	36.7
People per Household	2.65	2.62	3.75	3.06	2.8	2.61
Median Household Income	72,137	56,382	67,132	65,217	66,293	52,175
Average Income per Capita	34,258	27,292	25,127	28,892	29,913	27,466
Education						
High School Graduates	27.40%	39.60%	32.70%	33.20%	28.50%	29.60%
College degree - 2 year	8.30%	7.40%	9.60%	8.40%	8.10%	7.40%
College degree - 4 year	20.70%	12.90%	12.90%	15.50%	16.80%	17.30%
Graduate/Professional Degree	11.60%	8.10%	6.80%	8.80%	9.70%	10.10%
Expenditures per student	12,788	14,264	12,005	13,019	15,048	11,406
Students per teacher	17.2	16.9	17.8	17.3	16.4	15.5
Students per guidance counselor	1/292	1/250	1/319	1/287		
Economy						
Unemployment rate	5.30%	8.20%	7.70%	7.06%	6.70%	5.80%
2008 Job Growth	0.90%				0.70%	
2009 Job Growth	-0.40%				-0.20%	
Sales tax rate	0%	2.50%	0%	0.83%	0%	
Cost of living index	1	1.01	0.95	0.99		

Sources: Alaska Department of Labor and Workforce Development, 2009; Fried and Robinson, 2009; Personal communication with Alaska Department of Education and Early Development, 2010; and Rae, 2009.

Types of Economic Impacts of Critical Habitat Designation

Similar to the Draft RIR, our analysis monetizes, quantifies, or qualitatively assesses the incremental costs and benefits to entities directly attributable to the CHD (which are additional to any conservation efforts conducted under other regulations or guidelines). Our approach revolved around considering potential costs incurred by adapting to any of the five primary constituent elements (PCEs), as described on page 63087 of the proposed rule (U.S. Department of Commerce 2009). PCEs are physical or biological features of a habitat that are essential to the conservation of the species (i.e. critical habitat is comprised of the PCEs).

For example, we quantify costs resulting from ESA Section 7 consultations, including administrative costs, biological assessment costs, operational costs and the loss of revenue, permitting costs, project modification costs, the cost of project slippage, the cost of marine observers, the cost of demurrage, and other compliance costs associated with CHD for the Cook Inlet beluga whale. We have also quantitatively assessed the opportunity cost of foregone projects where applicable. There are several other 'costs' due to CHD that we were unable to incorporate into our modeling framework, such as safety concerns for shipping traffic in Cook Inlet waters that may result from CHD or the inability to conduct operations at certain times, tidal conditions, seasons, or light conditions. We calculated these costs for the CIR's economy as well as for the State of Alaska.

IV. Approach

Foundation for analytical approach

To determine appropriate estimated reductions in CIR output, we conducted dozens of personal and telephone interviews with stakeholders in Alaska (see Appendix B). Based on that information, we concluded that three levels of reduction in CIR output would reasonably cover the range of impacts for the industries potentially affected by CHD for the Cook Inlet beluga whale: 1) a 1% reduction, 2) a 5% reduction, and 3) a 10% reduction.

This range of output reduction is consistent with the range of impacts documented in numerous studies related to other ESA designations of critical habitat, including:

- In the Deschutes River Basin of Oregon, one study estimated that designation of bull trout habitat would decrease construction activity in the region by 5% and tourism by 2% (Sorte and Jacks, 2004).

- In California, a study estimated that CHD for the Alameda whipsnake could result in $19.2 million in direct losses and $14.4 million in secondary losses for a total loss of $33.5 million to the economies of Contra Costa and Alameda Counties (CRA International, 2006). Those impacts were based on restrictions imposed on construction.
- A study of the impact of the Stellar sea lion designation estimates that local businesses dependent on the groundfish fishery experienced at least $103.5 million lost in gross revenue in 1999 and 2000. Associated with this loss in gross revenue were a $43.5 million loss in direct labor payments and a $1.3 million loss in local tax revenue. It is estimated that the total loss including direct and secondary impacts was $207 million. These losses were caused by the restrictions on commercial fishing within Stellar sea lion critical habitat. (U.S. Dept. of Commerce, NOAA/NMFS, 2001).
- In Washington, sector analysis of impacts on winter recreation associated with the proposed expansion of designated critical habitat for the Canada lynx found that even a minor reduction in recreation visitors would create job related losses of about 16%, with direct and indirect losses of $817,000 annually to the rural economy (Gustanski et al, 2008).
- In Southeastern Wyoming, a study estimated that designation of critical habitat for the Preble's Meadow jumping mouse could reduce ranch profitability from 5% to 18% per mile of designated habitat (Taylor et al, 2004). These losses were caused by restrictions on grazing and hay production.
- In New Mexico, a study estimated that designation of critical habitat for the Rio Grande silvery minnow would reduce regional output by up to $14.6 million, reduce employment by 520 jobs, and reduce regional tax revenue by $2.0 million (Industrial Economics, Inc., 2002). Those losses were due to loss of crop production.

The range of potential reductions evaluated in this report is well within the various results of the studies described above. The range was also well within the range of potential maximum gross revenue for alternatives estimated for the Stellar sea lion Supplemental Environmental Impact Statement RIR analysis (2001). The range of maximum gross revenues for the alternatives ranged from $973 million to $1.358 billion. This suggests a potential reduction in maximum gross revenue of nearly 30% between the highest and lowest alternative. By comparison, this report's use of 1%, 5% and 10% as the entire potential range of output reductions is conservative.

Industries and Scenarios considered

This report provides estimates of the economic impact of the following economic industries in the CIR economy that may be affected by CHD for the Cook Inlet beluga whale: 1) Oil & Gas, 2) Mining, 3) Commercial Fishing, 4) Sport fishing, and 5) the Port of Anchorage. For each of these industries, we applied the 1%, 5% and 10% loss scenarios described above.

We investigated two scenarios, as outlined below, which may result from CHD. For each of the two scenarios, we will calculate the three potential loss scenarios of reduction in economic activities as explained above.

It is important to note here that the distribution of the potentially affected activities is not evenly distributed between Area 1 and Area 2 critical habitat designation. Some activities such as oil and gas and mining are only found in Area 2. Other activities such as fishing are primarily found in Area 2 but are also present in Area 1. On the other hand, activities such as the Port of Alaska, itself is only in Area 1. Thus, the distribution of economic impact is also not evenly distributed between the two areas of critical habitat designation.

Scenario 1: Status Quo

Scenario 2: Critical Habitat Designation occurs for proposed Area 1 and Area 2

- Impact on Oil and Gas
- Impact on Port of Anchorage
- Impact on Commercial fishing
- Impact on Mining
- Impact on Sport fishing

The Scenario 2 analysis assumes an impact on all the industries that we have considered, and will estimate the reduction in associated activity for the full extent of proposed CHD (Area 1 and 2). Scenario 2 in our analysis is equivalent to Scenario 2 as contained within the NMFS Draft RIR report.

Data collection

Several methods were employed to collect the background data necessary to establish the economic activity, operations, and future projects from entities that might be affected by CHD for the Cook Inlet beluga whale. A questionnaire was developed to solicit Resource Development Council for Alaska, Inc. members as to the costs associated with their current regulatory burden, and assist them in identifying costs that would be incurred directly or indirectly, because of CHD (Appendix A). This questionnaire was also intended to encourage discussion about potentially foregone projects or operational modifications that could become necessary with CHD. In-person interviews with regional representatives from industry, government, and nonprofit agencies were conducted February 1 through 5, 2010 to gather outstanding data, in the same vein as what was requested on the questionnaire. Additionally, phone interviews were conducted February 9 through 11 (Appendix B). We were able to obtain insights and perspectives representing a range of viewpoints from these interview sessions. The project team also reviewed available studies, reports, and research on the economic impacts in reduction in social welfare that can result from CHD (Appendix C).

An existing IO model was used to provide applicable multipliers and coefficients to changes in local business activity to show total impacts. With refinement by the Resource Dimensions team, the client, and other stakeholders, a disaggregated IO model was developed, and used to estimate direct, indirect, and induced economic impacts of CHD. We will first describe the IO modeling approach and then explain how the outputs can be useful in comparing alternatives.

IMPLAN modeling

Economic IO models are used to estimate the impact of business activity changes or to calculate the contributions of an industry to a regional economy. The basic premise of the IO framework is that each industry sells its output to other industries and final consumers and in turn purchases goods and services from other industries and primary factors of production. Therefore, the economic performance of each industry can be determined by changes in both final demand and the specific inter-industry relationships. IO tables assist in calculating overall changes in the flow of money in the local and regional economy, including direct, indirect, and induced effects. In this case, the effects are those associated with income and expenditures related to the industry activities for the five key sectors identified for this study on the CIR. The outputs are shown as estimates of changes in employment, personal income, business output, and gross regional product (value added).

The approach used here, joins that of an IO survey model, which involved obtaining data on the distribution of local sales for each sector, together with that of the IMPLAN, which uses secondary data to construct estimates of local economic activity. The current economic impact of affected industries in the CIR was estimated using 2008 IMPLAN (IMpact Analysis for PLANning). IMPLAN is a computerized database and modeling system used for creating regional economic models and IO tables.[4] IMPLAN can be used to construct zip code, county or multi-county IO models for any region in the U.S. The regional models are derived from technical coefficients of a national IO model and localized estimates of total gross outputs by sectors. IMPLAN adjusts national level data to fit the economic composition and estimated trade balance of a chosen region. This analysis used the recently introduced Version 3 of the IMPLAN software.

Two IMPLAN models were created for the analysis. The first was a core model for the CIR. The second was a periphery model that consisted of all the rest of Alaska. The core model was used to estimate the economic impact for the CIR, while the periphery model was used to estimate the economic impact of economic activity in the CIR on the rest of Alaska. By combining the model results from

[4] IMPLAN was originally developed by the United States Forest Service in cooperation with the Federal Emergency Management Agency and the United States Department of the Interior, Bureau of Land Management to assist in land and resource management planning. In 1993, its founders incorporated as Minnesota IMPLAN Group, Inc. (MIG) and have expanded and improved the original system. Software and data sets are available through the Minnesota IMPLAN Group, Inc. (MIG), Stillwater, MN.

the core model with the periphery model, it was possible to obtain an estimate of the economic impact of economic activity in the CIR on the State of Alaska. Because the core area includes Anchorage, most of the statewide economic impacts of economic activities in the CIR are concentrated in the CIR, with the economic impacts in other areas of Alaska being relatively small. In order to be consistent with the models, the base year for the analysis was 2008 and all dollar amounts are expressed in 2008 dollars. Due to the condensed timeframe necessitated by NMFS's public comment period and extensive time required to validate such comprehensive frameworks, it was not possible to validate the IMPLAN model for each region of Alaska. For the same reasons, the analysis primarily focuses on backward linkages in the Alaskan economy and generally does not consider the economic impacts of forward linkages[5].

V. Analyses

Cook Inlet Oil & Gas

The oil and gas industry has numerous facilities in and around Cook Inlet that could be affected by CHD. Table 3 summarizes the economic impact of oil and gas production in the CIR. Information from the Alaska Department of Natural Resources, Division of Oil and Gas (2009) indicates that there were 4.5 million barrels of oil production and 149.7 billion cubic feet of natural gas production in the CIR in 2008. Based on U.S. Energy Information Administration data (2010), it is estimated that the first purchase price for this oil was $95.04 per barrel in 2008 and that the wellhead price for this natural gas was $6.14 per thousand cubic feet in 2008. Combining these estimates indicates the value of production for oil and gas production in the CIR was nearly $1.4 billion in 2008 (Table 3). Considering indirect and induced effects associated with this production, the total economic impact of oil and gas production in the CIR is estimated to have been more than $2.0 billion in 2008. Total employment (direct and secondary) associated with oil and gas economic activity in the region was 5,153 jobs with labor income of more than $508 million. The average annual earnings per job for this employment were nearly $98,000. This compares with a regional average for all jobs of $51,966 in 2007 (Bureau of Economic Analysis, 2009). If the area of analysis is expanded to the State of Alaska, total output associated with oil and gas production in the CIR increases by $19.7 million, total employment increases by 71 jobs, and total labor earnings increase by $9.8 million. This increase represents economic linkages between the CIR and other areas of the state.

[5] In the context of IO modeling of economies, linkages are generally categorized into two groups according to the direction of interdependencies. Backward linkages refer to the relationship between a firm or industry and the suppliers of its inputs, or raw materials; or how a sector depends on others for supplies and services. An increase in the output of the firm or industry is transmitted backward, yielding an increase in the demand for inputs. The forward linkage identifies how a given sector distributes its outputs to the remaining economy.

Oil and gas production in the CIR is also an important source of tax revenue for the State of Alaska and local government. Table 4 summarizes the estimated government revenue in Alaska from oil and gas production in the CIR (the production tax is estimated based on the CIR's share of the total volume of Alaska oil and gas production). Because the actual state revenues specific to Cook Inlet oil and gas production were not available, the amount of state revenue had to be estimated based on state totals from the Alaska Department of Revenue, Tax Division (2008) for the four major categories of state revenue from oil and gas. The CIR share of this total revenue was estimated based on the relative value of output between oil and natural gas and the quantity of production of each in the CIR. Results from this procedure indicate that the total revenue to the State of Alaska from oil and gas production in the CIR in 2008 was $568.8 million including $506.0 million of unrestricted revenue and $62.8 million in restricted revenue. Local government revenue from oil and gas property in the CIR was $10.4 million in 2008 (Alaska Department of Commerce, Community, & Economic Development, 2009).

The production from known reserves for both oil and natural gas in the CIR are forecasted to decline substantially in the future. However, Thomas et al (2004) have estimated that there are 13 to 17 trillion cubic feet of natural gas reserves yet to be discovered within the Cook Inlet Basin. It is also estimates that there are potential oil reserves yet to be discovered within the Cook Inlet Basin in excess of 1.0 billion barrels of recoverable oil (U.S. Mineral Management Service, 2004). The costs to discover and develop these potential reserves would be substantial. Thomas et al estimate that efforts to find and develop 50 percent of the potential natural gas reserves would cost a minimum of $5.0 billion.

The economic impact of potential future oil and gas development on the CIR would be significant. Table 5 summarizes the economic impact for every $1 million invested on expenditures for oil and natural gas well drilling and the economic impact for every $1 million invested on expenditures for oil and natural gas support services. For drilling, the total impact for every $1 million of expenditures is $1.4 million in economic activity in the region, supporting 3.5 jobs with labor income of $249,224. The average annual earnings per job would be $71,138. If the area of analysis is expanded to the State of Alaska, total output associated with drilling in the CIR increases by $26,398, total employment increases by 0.1 jobs, and total labor earnings increase by $7,706 per $1 million of expenditures.

For support activities, the total impact of every $1 million of expenditures is $1.6 million in economic activity in the CIR. This economic activity would support 6.7 jobs with labor income of $485,642. The average annual earnings per job would be $72,560. If the area of analysis is expanded to the State of Alaska, total output associated with support activities in the CIR increases by $19,468, total employment increases by 0.1 jobs, and total labor earnings increase by $6,164 per $1 million expenditure.

Table 6 summarizes the economic impacts of potential reductions in CIR oil and gas production resulting from CHD. Under the low, medium, and high scenarios oil and gas production in the region could decrease by $13.9 million to $138.8 million. Considering

secondary effects, total economic activity in the region could decrease by $20.5 million to $204.7 million. This reduction would represent a loss of between 51 and 515 jobs and between $5.0 and $50.4 million in labor income. Slightly higher losses would occur if the study area were expanded to the State of Alaska.

Although the focus of this analysis is on the backward linkages associated with oil and gas production in the CIR, there are significant forward linkages for both oil and natural gas. For oil, there is a forward linkage to the Tesoro refinery that is the sole consumer of all Cook Inlet oil production (Popp, 2005). Cook Inlet oil production accounts for approximately one-third of Tesoro's requirement for feedstock (Popp, 2005). For natural gas, there are the forward linkages to the ConocoPhillips LNG plant and the region's electric and heating utilities. Natural gas from the Tyonek platform provides the majority of ConocoPhillips' source for the Kenai LNG (Liquefied natural gas) facility (ConocoPhillips, United States –Alaska). In addition, Southcentral Alaska depends heavily upon Cook Inlet natural gas. 67% of the Railbelt Region electricity is fueled by natural gas (Alaska Industrial Development and Export Authority, 2003). The Railbelt Region includes Anchorage, Fairbanks, Matanuska-Susitna, and the Kenai Peninsula, which contains approximately 75% of Alaska's population and accounts for over 85% of the state's electricity usage. In Anchorage, 80% of the households are heated with natural gas (Alaska Industrial Development and Export Authority, 2003).

Anything such as CHD that could affect electrical and heating costs is of particular concern in Alaska because these costs are already extremely high. The U.S. Energy Information Administration (2009) estimates that the cost of residential electricity in Alaska is the fourth highest in the nation, at $0.1675 cents per kWh. This is more than 40% higher than the U.S. average of $0.1176 cents per kWh.

Table 3. Economic Impact of Cook Inlet Oil & Gas Production (2008)

Cook Inlet Region				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$1,388,329,767	1,143	$301,282,016	$888,854,528
Indirect Effect	$336,911,229	1,430	$102,033,438	$181,532,444
Induced Effect	$321,840,925	2,580	$101,187,733	$190,466,473
Total Effect	$2,047,081,921	5,153	$504,503,187	$1,260,853,446
State of Alaska				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$1,388,329,767	1,143	$301,282,016	$888,854,528
Indirect Effect	$352,664,407	1,469	$104,565,423	$189,146,412
Induced Effect	$325,813,463	2,612	$102,603,683	$192,657,561
Total Effect	$2,066,807,637	5,224	$508,451,122	$1,270,658,502
Increase	$19,725,716	71	$3,947,935	$9,805,056

Sources: IMPLAN 2008; RDC study models 2010.

Table 4. Alaska Government Revenue from Cook Inlet Oil & Gas Production (2008)

State Government	
Unrestricted	Amount
Petroleum Corporate Income Tax	$30,618,140
Production Tax	$347,676,110
Petroleum Property Tax	$4,119,146
Royalties, Bonuses, Rents, & Interest	$123,629,966
Total Unrestricted	$506,043,362
Restricted	Amount
Permanent Fund & School Fund	$40,387,844
Tax Settlements to CBRF	$22,152,412
NPR-A Royalties, Rents, & Bonuses	$262,817
Total Restricted	$62,803,072
Grand Total	$568,846,434

Local Government	
Location	Amount
Municipality of Anchorage	$3,508,927
Kenai Peninsula Borough	$6,704,089
Matanuska-Susitna Borough	$83,449
Kenai City	$84,489
Total Cook Inlet	$10,380,954

Sources: 2008, Revenue Source Book, Alaska Department of Revenue, and *Alaska Taxable 2008*, Alaska Department of Commerce, Community and Economic Development.

Table 5. Economic Impact of Oil & Gas Development in Cook Inlet (2008)

Drilling - Cook Inlet Region ($1MM)				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$1,000,000	1.0	$120,574	$577,420
Indirect Effect	$242,540	1.2	$77,582	$124,409
Induced Effect	$162,913	1.3	$51,068	$96,129
Total Effect	$1,405,454	3.5	$249,224	$797,958

Support Activities - Cook Inlet Region ($1MM)				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$1,000,000	2.4	$284,767	$532,158
Indirect Effect	$303,728	1.8	$101,438	$163,882
Induced Effect	$317,197	2.5	$99,436	$187,173
Total Effect	$1,620,926	6.7	$485,642	$883,213

Drilling - State of Alaska ($1MM)				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$1,000,000	1.0	$120,574	$577,420
Indirect Effect	$264,481	1.3	$83,864	$135,386
Induced Effect	$167,371	1.3	$52,492	$98,689
Total Effect	$1,431,852	3.6	$256,930	$811,495
Increase	$26,398	0.1	$7,706	$13,536

Support Activities - State of Alaska ($1MM)				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$1,000,000	2.4	$284,767	$532,158
Indirect Effect	$318,330	1.8	$105,939	$171,519
Induced Effect	$322,064	2.6	$101,099	$189,901
Total Effect	$1,640,394	6.8	$491,806	$893,578
Increase	$19,468	0.1	$6,164	$10,365

Sources: IMPLAN 2008; RDC study models 2010.

Table 6. Economic Impact of Reductions in Cook Inlet Oil & Gas Production (2008)

Cook Inlet Region			
	1% Reduction	5% Reduction	10% Reduction
Direct Impact	$13,883,298	$69,416,488	$138,832,977
Total Impact	$20,470,819	$102,354,096	$204,708,192
Total Employment	51.5	257.6	515.3
Total Income	$5,045,032	$25,225,159	$50,450,319
Total Value Added	$12,608,534	$63,042,672	$126,085,345
State of Alaska			
	1% Reduction	5% Reduction	10% Reduction
Direct Impact	$13,883,298	$69,416,488	$138,832,977
Total Impact	$20,668,076	$103,340,382	$206,680,764
Total Employment	52.2	261.2	522.4
Total Income	$5,084,511	$25,422,556	$50,845,112
Total Value Added	$12,706,585	$63,532,925	$127,065,850

Sources: IMPLAN 2008; RDC study models 2010.

Mining

The Cook Inlet watershed is richly endowed with mineral resources. There are over 1,500 known mineral occurrences reported for the watershed in the Alaska Resource Data Files (http://ardf.wr.usgs.gov/). Currently there are no large mines operating in the area. However, there are a number of potential projects involving coal, gold, copper, and other minerals. In order to evaluate the potential impact of CHD on the mining industry in the CIR, two potential projects were considered in the analysis. One was the proposed Chuitna Coal Project and the other is the potential Pebble Project. Only the operating impacts of these two projects are analyzed. Construction impacts were not considered due to lack of data regarding how much of these expenditures would be spent in the region and because the construction impacts are not sustainable (they last only until the project development is completed).

The analysis for the Chuitna Coal Project consisted of inserting a 350-employee coal mine into the IMPLAN model for the CIR using standard IMPLAN values for the coal mining sector in Alaska. No attempt was made to adjust the production function to make it specific to the Chuitna Coal Project. Results from the model indicate that a 350-employee coal mine in the region would generate $141.8 million in direct output annually in the CIR (Table 7). Considering secondary effects (indirect and induced), the total economic impact of the mine is estimated to be $212.2 million. This economic activity would support a total (direct and secondary) employment of 823 jobs with labor earnings of $62.4 million. Average annual earnings per job are estimated to be $75,329. If the study area is expanded to include the State of Alaska total economic activity increases by $5.2 million, employment increases by 21 jobs, and labor income increases by $1.3 million.

The analysis for the Pebble Project consisted of inserting a 1,000 employee copper mine into the IMPLAN model for the CIR using standard IMPLAN values for the copper mining sector. No attempt was made to adjust the production function to make it specific to the Pebble Project. Although the mine would produce a number of minerals, the analysis assumes that it is primarily a copper mine. Results from the model indicate that a 1,000 employee copper mine in the region would generate $571.8 million in direct output annually in the CIR (Table 7). Considering secondary effects (indirect and induced), the total economic impact of the mine is estimated to be $787.1 million. This economic activity would support a total (direct and secondary) employment of 2,351 jobs with labor earnings of $177.1 million. Average annual earnings per job are estimated to be $75,197. If the study area is expanded to include the State of Alaska, total economic activity increases by $10.2 million, employment increases by 38 jobs, and labor income increases by $5.3 million.

Although it is conceivable that CHD could mean either or both of these projects are not feasible, the analysis only considers the impact of the 1%, 5%, and 10% percent reductions in output. Table 8 summarizes the economic impacts of potential reductions in the Chuitna Coal and Pebble projects resulting from CHD. Under the low, medium and high scenarios, output from the Chuitna Coal Project could

decrease by $1.4 million to $14.8 million. Considering secondary effects total economic activity in the region could decrease by $2.1 million to $21.2 million. This reduction would represent a loss of between 8 and 82 jobs and between $623,840 and $6.2 million in labor income. Slightly higher losses would occur if the study area were expanded to the State of Alaska.

Under the low, medium, and high scenarios, output from the Pebble Project could decrease by $5.7 million to $57.2 million dollars. Considering secondary effects total economic activity in the region could decrease by $7.9 million to $78.7 million. This reduction would represent a loss of between 23 and 235 jobs and between $1.8 million and $17.7 million in labor income. Slightly higher losses would occur if the study area were expanded to the State of Alaska.

Table 7. Economic Impact of Mining in Cook Inlet Region (2008)

Chuitna Coal Project - Cook Inlet 2008				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$141,775,296	350.0	$40,510,992	$78,975,232
Indirect Effect	$29,754,840	146.9	$9,107,376	$15,567,392
Induced Effect	$40,721,108	326.4	$12,765,638	$24,030,144
Total Effect	$212,251,244	823.3	$62,384,006	$118,572,768

Pebble Project - Cook Inlet 2008				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$571,846,976	1,000.0	$110,737,000	$374,014,976
Indirect Effect	$100,914,767	432.3	$30,512,986	$55,505,455
Induced Effect	$114,381,621	918.8	$35,859,510	$67,506,340
Total Effect	$787,143,363	2,351.1	$177,109,496	$497,026,770

Chuitna Coal Project - State of Alaska 2008				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$141,775,296	350.0	$40,510,992	$78,975,232
Indirect Effect	$34,185,692	161.4	$10,154,374	$17,679,768
Induced Effect	$41,517,779	332.8	$13,029,831	$24,482,214
Total Effect	$217,478,767	844.2	$63,695,196	$121,137,214
Increase	$5,227,523	20.9	$1,311,190	$2,564,446

Pebble Project - State of Alaska 2008				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$571,846,976	1,000.0	$110,737,000	$374,014,976
Indirect Effect	$109,245,060	456.0	$32,464,747	$59,778,655
Induced Effect	$116,208,333	933.5	$36,482,792	$68,532,314
Total Effect	$797,300,370	2,389.5	$179,684,539	$502,325,944
Increase	$10,157,006	38.4	$2,575,043	$5,299,174

Sources: IMPLAN 2008; RDC study models, 2010.

Table 8. Economic Impact of Reductions in Potential Mining Output (2008)

Chuitna Coal Project - Cook Inlet Region			
	1% Reduction	5% Reduction	10% Reduction
Direct Impact	$1,417,753	$7,088,765	$14,177,530
Total Impact	$2,122,512	$10,612,562	$21,225,124
Total Employment	8.2	41.2	82.3
Total Income	$623,840	$3,119,200	$6,238,401
Total Value Added	$1,185,728	$5,928,638	$11,857,277

Pebble Project - Cook Inlet Region			
	1% Reduction	5% Reduction	10% Reduction
Direct Impact	$5,718,470	$28,592,349	$57,184,698
Total Impact	$7,871,434	$39,357,168	$78,714,336
Total Employment	23.5	117.6	235.1
Total Income	$1,771,095	$8,855,475	$17,710,950
Total Value Added	$4,970,268	$24,851,339	$49,702,677

Chuitna Coal Project - State of Alaska			
	1% Reduction	5% Reduction	10% Reduction
Direct Impact	$1,417,753	$7,088,765	$14,177,530
Total Impact	$2,174,788	$10,873,938	$21,747,877
Total Employment	8.4	42.2	84.4
Total Income	$636,952	$3,184,760	$6,369,520
Total Value Added	$1,211,372	$6,056,861	$12,113,721

Pebble Project - State of Alaska			
	1% Reduction	5% Reduction	10% Reduction
Direct Impact	$5,718,470	$28,592,349	$57,184,698
Total Impact	$7,973,004	$39,865,018	$79,730,037
Total Employment	23.9	119.5	239.0
Total Income	$1,796,845	$8,984,227	$17,968,454
Total Value Added	$5,023,259	$25,116,297	$50,232,594

Sources: IMPLAN 2008; RDC study models, 2010.

Commercial Fishing

Commercial fishing has a long history in the CIR that continues today. The analysis of the economic impact of commercial fishing in the region is based on the Alaska Department of Fish and Game, Division of Commercial Fisheries' *Lower and Upper Cook Inlet Commercial Seafood Industry Processing Buying Activity, 2008* report (2010). The analysis for commercial fishing was conducted from two perspectives. The first focused only on the economic impacts of salmon fishing in Cook Inlet since salmon are identified as a PCE in the proposed CHD. The second focused on the economic impact of seafood processing in the CIR assuming that CHD could affect the entire seafood processing industry in the region in terms of their operation in Cook Inlet.

The estimated economic impact of the salmon fishing in the Cook Inlet is summarized in the top part of Table 9. The Buying Activity report indicated that 20.7 million pounds of salmon were purchased by the Cook Inlet seafood processing industry in 2008 with a purchase value of $22.3 million. The IMPLAN model for the CIR estimates that the total economic impact of the $22.3 million, including secondary impacts, was $39.0 million. The total economic activity associated with salmon fishing in Cook Inlet was estimated to support 709 jobs with labor earnings of $8.7 million. If the study area is broadened to include the State of Alaska, output increases by $752,460, employment increases by 1.8 jobs, and labor income increases by $105,979.

If the analysis is expanded to consider the entire seafood processing industry in the region, the economic impact estimates are substantially higher due to the value-added by processing seafood and because the industry processes more than just salmon. The Buying Activity report indicates that in addition to salmon the seafood processers in Cook Inlet purchased $30.7 million of halibut and $4.6 million in other seafood. The IMPLAN database estimates that total industry output for seafood processing was $204.5 million in 2008 (Table 9). Based on this level of output, the total economic activity including secondary effects associated with seafood processing in the CIR was estimated to be $416.1 million. This economic activity was estimated to support 3,161 jobs with labor earnings of $77.2 million. If the study area is broadened to include the State of Alaska, output increases by $4.0 million, employment increases by 20.4 jobs, and labor income increases by $928,110. These estimates include the economic impact of salmon fishing discussed above.

Table 10 summarizes the economic impacts of potential reductions in CIR commercial fishing and seafood processing resulting from CHD. Under the low, medium and high loss scenarios, salmon fishing in the region could decrease by $222,630 to $2.2 million dollars. Considering secondary effects total economic activity in the region could decrease by $390,100 to $3.9 million. This reduction would represent a loss of between 7 and 71 jobs and between $87,205 and $872,051 in labor income. Slightly higher losses would occur if the study area were expanded to the State of Alaska.

Under the low, medium, and high loss scenarios seafood processing in the region could decrease by $2.0 million to $20.4 million dollars. Considering secondary effects total economic activity in the region could decrease by $4.2 million to $41.6 million. This reduction would represent a loss of between 32 and 316 jobs and between $771,557 and $7.7 million in labor income. Slightly higher losses would occur if the study area were expanded to the State of Alaska. These estimates include the economic impact of salmon fishing discussed above.

Table 9. Economic Impact of Commercial Fishing and Seafood Processing – Cook Inlet Region (2008)

Salmon Fishing - Cook Inlet 2008

Impact Type	Output	Employment	Income	Value Added
Direct Effect	$22,263,028	628.7	$4,717,635	$5,132,720
Indirect Effect	$11,039,174	34.2	$2,218,248	$4,133,520
Induced Effect	$5,707,756	45.9	$1,784,625	$3,366,856
Total Effect	$39,009,958	708.7	$8,720,507	$12,633,096

Salmon Fishing - State of Alaska 2008

Impact Type	Output	Employment	Income	Value Added
Direct Effect	$22,263,028	628.7	$4,717,635	$5,132,720
Indirect Effect	$11,710,443	35.3	$2,296,086	$4,265,828
Induced Effect	$5,788,947	46.6	$1,812,766	$3,412,164
Total Effect	$39,762,418	710.5	$8,826,486	$12,810,712
Increase	$752,460	1.8	$105,979	$177,616

Seafood Processing - Cook Inlet 2008

Direct Effect	$204,517,008	616.2	$21,223,614	$23,729,024
Indirect Effect	$161,754,432	2,145.2	$40,324,681	$62,951,648
Induced Effect	$49,828,639	400.0	$15,607,367	$29,393,499
Total Effect	$416,100,079	3,161.5	$77,155,662	$116,074,171

Seafood Processing - State of Alaska 2008

Direct Effect	$204,517,008	616.2	$21,223,614	$23,729,024
Indirect Effect	$164,994,766	2,159.7	$40,999,464	$64,073,448
Induced Effect	$50,558,785	405.9	$15,860,694	$29,800,453
Total Effect	$420,070,559	3,181.9	$78,083,772	$117,602,925
Increase	$3,970,480	20.4	$928,110	$1,528,754

Sources: IMPLAN 2008; RDC study models, 2010.

Table 10. Economic Impact of Reduction in Commercial Fishing and Seafood Processing – Cook Inlet Region (2008)

Salmon Fishing - Cook Inlet				Seafood Processing - Cook Inlet			
	1% Reduction	5% Reduction	10% Reduction		1% Reduction	5% Reduction	10% Reduction
Direct Impact	$222,630	$1,113,151	$2,226,303	Direct Impact	$2,045,170	$10,225,850	$20,451,701
Total Impact	$390,100	$1,950,498	$3,900,996	Total Impact	$4,161,001	$20,805,004	$41,610,008
Total Employment	7.1	35.4	70.9	Total Employment	31.6	158.1	316.1
Total Income	$87,205	$436,025	$872,051	Total Income	$771,557	$3,857,783	$7,715,566
Total Value Added	$126,331	$631,655	$1,263,310	Total Value Added	$1,160,742	$5,803,709	$11,607,417
Salmon Fishing - State of Alaska				**Seafood Processing - State of Alaska**			
	1% Reduction	5% Reduction	10% Reduction		1% Reduction	5% Reduction	10% Reduction
Direct Impact	$222,630	$1,113,151	$2,226,303	Direct Impact	$2,045,170	$10,225,850	$20,451,701
Total Impact	$397,624	$1,988,121	$3,976,242	Total Impact	$4,200,706	$21,003,528	$42,007,056
Total Employment	7.1	35.5	71.1	Total Employment	31.8	159.1	318.2
Total Income	$88,265	$441,324	$882,649	Total Income	$780,838	$3,904,189	$7,808,377
Total Value Added	$128,107	$640,536	$1,281,071	Total Value Added	$1,176,029	$5,880,146	$11,760,293

Sources: IMPLAN 2008; RDC study models, 2010.

Sport Fishing

An important component of Alaska's tourism sector is sport fishing. This section will summarize the expected impact of CHD on sport fishing. There is an expansive body of literature on the impact of designating marine protected areas on fish populations. Such designations limit fishing within the boundaries of these areas in hopes that populations will stabilize or increase. While the literature suggests that such designations can have a positive impact on fish populations, the studies modeled species that tend not to migrate long distances. Thus, designating a small area (relative to their range) has little or no effect on population dynamics. The sport fishing that is occurring in the CIR is for species such as salmon that have considerably longer ranges than only Cook Inlet. CHD will limit access at the expense of Alaska and not in areas outside of Alaska. Therefore, there is no reason to expect a population increase in these fisheries because of CHD.

According to Southwick Associates, et al. (2008) Alaskan sport fishing angler days topped over 2.5 million (Table 11). The Cook Inlet accounted for 48% of the activity. Nonresidents accounted for over 63% of the Cook Inlet activity.

Table 11. Sport fishing angler days in 2007

	RESIDENT	NONRESIDENT	TOTAL
COOK INLET	761,221	481,877	1,243,098
REST OF THE STATE	698,159	598,561	1,296,720
TOTAL	1,459,380	1,080,438	2,539,818

Source: Southwick Associates et al (2008).

Angler activity can be broken out into three categories: Shore fishing, private boat, and charter. Each activity has a different expenditure profile. We used the expenditure profile summarized by Hermann et al (2001) as a basis. Based upon this study, angler populations are apportioned into the categories summarized in Table 12. Nonresident private boats and charters represent the largest category of anglers with 39% of the activity. Resident nonlocal angler activities are the next largest category with almost 30% of the total activity.

Table 12. Anglers by category – Cook Inlet Region (2007)

		PERCENT within CLASS	PERCENT across CLASS
LOCAL RESIDENT	Shore	26.30%	6.50%
	Private	58.30%	14.40%
	Charter	15.40%	3.80%
RESIDENT NONLOCAL	Shore	7.70%	2.40%
	Private	60.00%	18.80%
	Charter	32.20%	10.10%
NONRESIDENT	Shore	11.70%	5.20%
	Private	29.40%	13.00%
	Charter	58.80%	25.90%

Sources: Hermann et al. (2001).

Expenditures per day are summarized in Table 13 based upon Hermann et al (2001), and include lodging, transportation, and other recreational-type expenditures. These estimates are used to estimate total impacts of nonresident sport fishing activity. Because these numbers were collected for activities in 1997, we inflate these to 2008 dollars in the impact estimates.

Table 13. Expenditures per day by anglers – Cook Inlet Region (2008)

ANGLER EXPENDITURES ($/day)	LOCAL RESIDENT			RESIDENT NONLOCAL			NONRESIDENT		
	Shore	Private	Charter	Shore	Private	Charter	Shore	Private	Charter
Vehicle Fuel	$7.82	$7.82	$7.82	$14.57	$12.99	$15.81	$9.34	$7.81	$8.08
Vehicle Rental	$0.00	$0.00	$0.00	$0.00	$0.39	$3.97	$28.91	$2.92	$18.92
Airfare	$0.00	$0.00	$0.00	$0.00	$0.35	$5.15	$26.90	$24.76	$32.04
Other Transportation	$0.70	$0.70	$0.70	$0.00	$1.31	$1.83	$0.93	$2.30	$2.33
Lodging	$3.15	$3.15	$3.15	$3.86	$6.20	$21.19	$14.83	$7.83	$22.94
Groceries	$8.00	$8.00	$8.00	$12.43	$14.44	$13.76	$7.47	$10.72	$9.93
Restaurant and Bar	$10.75	$10.75	$10.75	$3.43	$9.58	$13.95	$10.20	$6.65	$9.63
Charter or Guide	$0.00	$0.00	$112.00	$0.00	$0.00	$116.40	$0.00	$0.00	$140.75
Fishing Gear	$2.14	$7.12	$2.00	$4.50	$5.53	$34.58	$20.00	$17.12	$15.50
Fish Processing	$0.00	$0.92	$10.50	$0.00	$2.33	$7.14	$9.62	$7.87	$32.72
Derby	$0.00	$0.36	$11.70	$0.00	$0.18	$2.13	$0.95	$1.65	$1.37
Boat Fuel and Repair	$0.00	$15.89	$0.00	$0.00	$31.53	$0.00	$0.00	$9.00	$0.00
Moorage and Hauling	$0.00	$8.36	$0.00	$0.00	$5.48	$0.00	$0.00	$9.00	$0.00
TOTAL	$32.56	$63.07	$166.62	$38.79	$90.31	$235.91	$129.15	$107.63	$294.21

Sources: Hermann et al. (2001); RDC models, 2010.

The estimated economic impact of sport fishing in the CIR is summarized in Table 14. The $193.3 million of spending by nonresident and nonlocal sport fishermen in the CIR is estimated to have a total economic impact of $319.1 million. This economic activity supports an estimated 2,345 jobs in the CIR with labor income of $76.0 million. If the study area is broadened to include the State of Alaska, total output increases by $4.2 million, employment increases by 39 jobs, and labor income increases by $1.5 million.

Table 14. Economic Impact of Sport Fishing – Cook Inlet Region (2008)

Non-Resident & Non-Local Sports Fishing - Cook Inlet 2008				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$193,320,711	1,438.4	$37,831,586	$63,360,320
Indirect Effect	$76,131,958	508.3	$22,594,705	$41,284,128
Induced Effect	$49,644,734	398.0	$15,558,861	$29,293,280
Total Effect	$319,097,403	2,344.7	$75,985,152	$133,937,728

Non-Resident & Non-Local Sports Fishing - State of Alaska 2008				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$193,320,711	1,438.4	$37,831,586	$63,360,320
Indirect Effect	$79,391,655	539.6	$23,751,573	$42,914,456
Induced Effect	$50,579,973	405.5	$15,870,175	$29,822,962
Total Effect	$323,292,339	2,383.4	$77,453,335	$136,097,738
Increase	$4,194,936	38.7	$1,468,183	$2,160,010

Sources: IMPLAN 2008; RDC study models, 2010.

Table 15 summarizes the economic impacts of potential reductions in sport fishing in Cook Inlet resulting from CHD. Under the low, medium and high loss scenarios sport fishing in Cook Inlet could decrease by $1.9 million to $19.3 million dollars. Considering secondary effects total economic activity in the region could decrease by $3.1 million to $31.9 million. This reduction would represent a loss of between 23 and 117 jobs and between $759,852 and $7.6 million in labor income. Slightly higher losses would occur if the study area were expanded to the State of Alaska.

Table 15. Economic Impact of Reduction in Sport Fishing – Cook Inlet Region (2008)

Non-Resident & Non-Local Sports Fishing - Cook Inlet 2008			
	1% Reduction	5% Reduction	10% Reduction
Direct Effect	$1,933,207	$9,666,036	$19,332,071
Total Effect	$3,190,974	$15,954,870	$31,909,740
Total Employment	23.4	117.2	234.5
Total Income	$759,852	$3,799,258	$7,598,515
Total Value Added	$1,339,377	$6,696,886	$13,393,773

Non-Resident & Non-Local Sports Fishing - State of Alaska 2008			
	1% Reduction	5% Reduction	10% Reduction
Direct Effect	$1,933,207	$9,666,036	$19,332,071
Total Effect	$3,232,923	$16,164,617	$32,329,234
Total Employment	23.8	119.2	238.3
Total Income	$774,533	$3,872,667	$7,745,333
Total Value Added	$1,360,977	$6,804,887	$13,609,774

Sources: IMPLAN 2008; RDC study models, 2010.

Port of Anchorage

The Port of Anchorage is a Commercial Strategic Seaport serving the majority of the residents within the State of Alaska. 90% of all consumer goods are provided to 80% of the State's population transit through the Port of Anchorage (State of Alaska, 2007). In 2008, total tonnage through the Port totaled 4.4 million tons.

In order to estimate the economic impact of the Port of Anchorage it was assumed that the Port was essential to all of the water transportation industry in the CIR. In the CIR model, the water transportation sector consists of two sectors: 1) Water Transportation and 2) Water Transportation Support Services. The Water Transportation sector includes the shipping companies that are involved in providing water transportation of passengers and cargo. Scenic and sightseeing water transportation services are not included in this sector. The Water Transportation Support Service includes the port and harbor operation, stevedoring and other marine cargo handling services, navigational service, and ship maintenance and repair businesses.

Based on the IMPLAN database and Bureau of Labor Statistics (BLS) information, it was estimated that the total output for the two water transportation sectors was $132.7 million in 2008 (Table 16). The CIR model estimated that including secondary effects the total economic impact of the POA was $208.4 million. This economic activity is estimated to have supported 1,034 jobs with labor earnings of $59.7 million. If the study area is broadened to include the State of Alaska, total output increases by $4.6 million, employment increases by 38 jobs, and labor income increases by $2.3 million.

Table 17 summarizes the economic impacts of potential reductions in economic activity at the Port of Anchorage resulting from CHD. Under the low, medium and high loss scenarios, the activity at the Port could decrease by $1.3 million to $13.3 million dollars. Considering secondary effects, total economic activity in the region could decrease by $2.1 million to $20.8 million. This reduction would represent a loss of between 10 and 103 jobs and between $597,381 and $6.0 million in labor income. Slightly higher losses would occur if the study area were expanded to the State of Alaska.

The contribution of the Port of Anchorage to the CIR economy goes far beyond the generation of jobs and income from providing water transportations. The Port is part of the transportation infrastructure that links Alaskans and Alaska businesses to each other and to the rest of the world. Without these links, both the cost of doing business and the cost of living would be much higher than they are today. This is particularly important since the cost of living and doing business is already high in Alaska. In 2008, the cost of living in Anchorage was 25.5% above the national average with the cost of groceries 42.5% above the national average (Fried and Robinson

2009). The cost of living in more remote areas of Alaska can be up to 50% higher than in Anchorage, placing a disproportionate burden on these populations. Although we were not able to measure the value of this aspect of the Port, it is no doubt substantial.

Table 16. Economic Impact of the Port of Anchorage (2008)

Economic Impact of Port of Anchorage - Cook Inlet 2008				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$132,712,604	500.0	$36,005,056	$59,045,952
Indirect Effect	$36,737,290	222.4	$11,524,733	$20,723,777
Induced Effect	$38,921,124	311.8	$12,208,302	$22,982,932
Total Effect	$208,371,018	1,034.2	$59,738,090	$102,752,660

Economic Impact of Port of Anchorage - State of Alaska 2008				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$132,712,604	500.0	$36,005,056	$59,045,952
Indirect Effect	$40,233,490	251.3	$13,454,602	$22,988,790
Induced Effect	$40,070,679	320.9	$12,574,698	$23,644,469
Total Effect	$213,016,773	1,072.2	$62,034,357	$105,679,211
Increase	$4,645,755	38.0	$2,296,267	$2,926,551

Sources: IMPLAN 2008; RDC study models, 2010.

Table 17. Economic Impact of Reduction in Port of Anchorage (2008)

Economic Impact of Port of Anchorage - Cook Inlet 2008			
	1% Reduction	5% Reduction	10% Reduction
Direct Effect	$1,327,126	$6,635,630	$13,271,260
Total Effect	$2,083,710	$10,418,551	$20,837,102
Total Employment	10.3	51.7	103.4
Total Income	$597,381	$2,986,905	$5,973,809
Total Value Added	$1,027,527	$5,137,633	$10,275,266

Economic Impact of Port of Anchorage - State of Alaska 2008			
	1% Reduction	5% Reduction	10% Reduction
Direct Effect	$1,327,126	$6,635,630	$13,271,260
Total Effect	$2,130,168	$10,650,839	$21,301,677
Total Employment	10.7	53.6	107.2
Total Income	$620,344	$3,101,718	$6,203,436
Total Value Added	$1,056,792	$5,283,961	$10,567,921

Sources: IMPLAN 2008; RDC study models, 2010.

Other Potential Economic Impacts

There are a number of other economic sectors that could be negatively impacted by the designation of critical habitat. Due to the time constraints of this study, many of these economic impacts could not be precisely quantified. Instead, the impacts to a few of these sectors, or to specific projects, are discussed qualitatively below.

Tourism: Although Cook Inlet is not currently used as a port of call for cruise ships, interviews from one representative from a major cruise line indicate that current plans include at least one new ship routing through the Port of Anchorage beginning in 2010. If the Cook Inlet beluga whale CHD discourages that company from using Cook Inlet as a port of call, the economic loss to the region would be significant. The estimated opportunity costs of this one ship, for example; assuming 1,500 passengers per ship at six seasonal tours and $522 of expenditures per visitor, is equivalent to about $7.5 million in total annual impact, 67 jobs, and $1.9 million in labor income to the CIR.

Knik Arm Bridge and Toll Authority (KABATA): The Knik Arm Toll Bridge is a proposed transportation link between the Matanuska-Susitna Borough and Anchorage. This project has a number of important economic benefits for the CIR. First, the construction project itself will significantly benefit the regional economy. Table 18 shows the economic impact of spending $1 million on road and bridge projects. The Knik Arm Toll Bridge project is estimated to cost $564 million and depending on the level of regional expenditures could generate *several* thousand jobs throughout the economy during the construction period (Insight Research Corporation, 2007). The project could also have significant indirect economic impacts, including reducing transportation costs between the Matanuska-Susitna Borough and Anchorage, and reducing travel time to Denali National Park. If the Cook Inlet beluga whale CHD results in construction delays to this project, the economic impact could escalate rapidly. For example, the Federal Highway Administration has estimated that each year of delay adds an additional $25 million to the bridge's construction costs (KABATA, 2008). KABATA has estimated that CHD could delay the project for 2.5 years including 18 months due to consultation and critical habitat PCEs and an additional 12 months for construction delays due to critical habitat and ESA restrictions (KABATA, 2008). If the project were abandoned altogether, the economic impact could be even more substantial.

Table 18. Economic Impacts of $1 Million of Construction – Cook Inlet Region (2008)

Commercial Structures				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$1,000,000	5.6	$410,775	$466,251
Indirect Effect	$338,352	1.9	$105,652	$164,842
Induced Effect	$424,253	3.4	$132,925	$250,328
Total Effect	$1,762,606	11.0	$649,352	$881,421

Road & Bridge				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$1,000,000	6.2	$449,722	$475,537
Indirect Effect	$394,971	2.2	$121,508	$191,263
Induced Effect	$469,287	3.8	$147,034	$276,899
Total Effect	$1,864,259	12.1	$718,264	$943,699

Manufacturing Structures				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$1,000,000	5.4	$391,873	$472,570
Indirect Effect	$264,145	1.4	$81,053	$133,062
Induced Effect	$388,467	3.1	$121,713	$229,214
Total Effect	$1,652,612	9.9	$594,639	$834,845

Residential				
Impact Type	Output	Employment	Income	Value Added
Direct Effect	$1,000,000	6.9	$443,428	$452,174
Indirect Effect	$389,308	2.9	$126,656	$203,806
Induced Effect	$468,245	3.8	$146,764	$276,297
Total Effect	$1,857,553	13.5	$716,848	$932,277

Sources: IMPLAN 2008; RDC study models, 2010.

Community Development Projects: In addition to the Knik Arm Toll Bridge, there are a number of other large-scale community development and infrastructure projects planned, or in the pre-proposal stage, in and around the CIR. These include projects such as the expansion of the Ted Stevens International Airport, railroad expansion and maintenance, Chugach Electric's electric distribution and submarine cable maintenance, the telecommunication industry's fiber optic cables, and the proposed Fire Island Wind Project, as well as tidal, geothermal, and hydroelectric energy opportunities. The projects too have the same potential economic benefit identified in Table 19 to the regional economy. Delay or abandonment of these projects for the protection of critical habitat could have significant economic impacts.

Anchorage Water and Wastewater Utility (AWWU) Discharges: AWWU handles the wastewater for Anchorage, particularly from the John M. Asplund Wastewater Treatment Facility at Point Woronzof. Designation of critical habitat could require the expenditure of $400-$600 million dollars to upgrade AWWU's facilities. These costs would be passed on to ratepayers, and could potentially triple Anchorage residents' wastewater bills.

Port MacKenzie: Port MacKenzie is currently developing a rail line extension that would support the economic development within the Matanuska-Susitna Borough. Commodities including wood chips and gravel are currently shipped from Port MacKenzie and future shipments of coal and other materials could be shipped out, and goods could be shipped into Port MacKenzie for distribution to the Matanuska-Susitna Valley and Interior Alaska via the proposed rail extension to Port MacKenzie. If the CHD decreases the use of Port MacKenzie, there would be a corresponding economic impact to the Matanuska-Susitna Borough as well.

Vessel Traffic: Restrictions on shipping or vessel traffic for the protection of Cook Inlet beluga whale critical habitat would necessarily affect the costs of goods sold in the CIR. Nearly all of Alaska's goods are brought into Anchorage on commercial vessels. The CHD could increase costs by requiring observers on board, decrease efficiency by setting speed limits or time and area restrictions, and ultimately raise the cost of all goods, and subsequent services, paid for by Alaskans. Any shipping delays will have particularly significant consequences for this area because shipping schedules are affected by tides and delays are compounded by the fact that Anchorage has minimal storage capacity for goods and must carefully coordinate shipping schedules.

Energy Infrastructure: Because of the unique nature of Cook Inlet, much of its energy infrastructure runs under Cook Inlet. The ability to repair, maintain and install new subsea cables (for example, from the proposed Fire Island Wind Project) or subsea pipelines is critical to a reliable energy infrastructure in Southcentral Alaska. CHD could lead to additional process or delay in approvals for such critical infrastructure management, or lead to noise restrictions or other requirements that could significantly increase the costs of such activities regardless of whether Cook Inlet beluga whales are themselves impacted by such activities.

VI. Summary

The results of the analysis are summarized in terms of two possible scenarios. Scenario 1 represents the status quo, which is the current economic impact of the affected industries. Scenario 2 assumes that both Area 1 and Area 2 are designated as critical habitat.

The losses discussed throughout this report represent the estimated annual losses to the CIR. These losses could continue throughout the 10-year period considered in the Draft RIR. To account for this, the present value of the losses was calculated for the 10-year period. Two discount rates were used – 3% and 7%. The results indicated that in terms of reductions in direct output the estimated loss ranged from $224.6 million to $2.2 billion at the 1% to 10% reductions with a 3% discount rate and from $184.9 million to $1.8 billion at the 1% to 10% reductions with a 7% discount rate. In terms of total output, the results indicated that the estimated loss ranged from $340.4 million to $3.4 billion at the 1% to 10% reductions with a 3% discount rate and from $280.2 million to $2.8 billion at the 1% to 10% reductions with a 7% discount rate. In terms of total labor income, the results indicated that the estimated losses ranged from $81.6 million to $816.2 million at the 1% to 10% reductions with a 3% discount rate and from $67.2 million to $672.1 million at the 1% to 10% reductions with a 7% discount rate.

Table 19 summarizes the potential effects of CHD on direct and total output in the CIR. Under Scenario 1 – Status Quo, the affected industries directly produce $2.6 billion of output, with $1.9 billion of this amount representing current production and $713.6 million representing potential future production from mining. Under Scenario 2 (Area 1 and Area 2), the loss in direct production ranges from $26.3 million to $263.3 million depending on whether the loss in production is 1%, 5%, or 10%.

Under Scenario 1 (Status Quo), total production associated with the affected industries including secondary effects is $4.0 billion of output, with $3.0 billion of this amount representing current production and $999.4 million representing potential future production from mining. Under Scenario 2 (Area 1 and Area 2), the loss in total production ranges from $39.9 million to $399.0 million depending on whether the loss in production is 1%, 5%, or 10%.

Table 20 summarizes the potential effects of CHD on total employment and total labor earnings in the CIR. Under Scenario 1 (Status Quo), total employment associated with the affected industries, including secondary effects is 14,868 jobs, with 11,693 of these jobs representing current employment and 3,174 of these jobs representing potential future employment from mining. Under Scenario 2 (both Area 1 and Area 2), the loss in total employment ranges from 149 jobs to 1487 jobs depending on whether the loss in production is 1%, 5% or 10%.

Under Scenario 1 (Status Quo), total labor earnings associated with the affected industries including secondary effects is $956.9 million, with $717.3 million of this amount representing current labor earnings and $239.5 million of this amount representing potential future labor earnings from mining. Under Scenario 2 (Area 1 and Area 2), the loss in total labor earnings ranges from $9.6 million to $95.7 million depending on whether the loss in production is 1%, 5%, or 10%.

Table 19. Summary of Direct & Total Output – Cook Inlet Region (2008)

Direct Output				
Industry	Scenario 1 Status Quo	Loss Scenario 2 1.0%	Loss Scenario 2 5.0%	Loss Scenario 2 10.0%
Oil & Gas Production	$1,388,329,767	$13,883,298	$69,416,488	$138,832,977
Salmon Fishing	$22,263,028	$222,630	$1,113,151	$2,226,303
Seafood Processing (1)	$182,253,980	$1,822,540	$9,112,699	$18,225,398
Sport Fishing	$193,320,711	$1,933,207	$9,666,036	$19,332,071
Port of Anchorage	$132,712,604	$1,327,126	$6,635,630	$13,271,260
Subtotal Current	$1,918,880,090	$19,188,801	$95,944,005	$191,888,009
Chuitna Coal Project	$141,775,296	$1,417,753	$7,088,765	$14,177,530
Pebble Project	$571,846,976	$5,718,470	$28,592,349	$57,184,698
Subtotal Potential	$713,622,272	$7,136,223	$35,681,114	$71,362,227
Grand Total	$2,632,502,362	$26,325,024	$131,625,118	$263,250,236

Total Output				
Industry	Scenario 1 Status Quo	Loss Scenario 2 1.0%	Loss Scenario 2 5.0%	Loss Scenario 2 10.0%
Oil & Gas Production	$2,047,081,921	$20,470,819	$102,354,096	$204,708,192
Salmon Fishing	$39,009,958	$390,100	$1,950,498	$3,900,996
Seafood Processing (1)	$377,090,121	$3,770,901	$18,854,506	$37,709,012
Sport Fishing	$319,097,403	$3,190,974	$15,954,870	$31,909,740
Port of Anchorage	$208,371,018	$2,083,710	$10,418,551	$20,837,102
Subtotal Current	$2,990,650,421	$29,906,504	$149,532,521	$299,065,042
Chuitna Coal Project	$212,251,244	$2,122,512	$10,612,562	$21,225,124
Pebble Project	$787,143,363	$7,871,434	$39,357,168	$78,714,336
Subtotal Potential	$999,394,607	$9,993,946	$49,969,730	$99,939,461
Grand Total	$3,990,045,028	$39,900,450	$199,502,251	$399,004,503

(1) Net of Salmon Fishing - Since the impact estimates for Seafood Processing includes the backward linkage to fishing, it is expressed as the net of salmon fishing to avoid double counting.

Sources: IMPLAN 2008; RDC study models, 2010.

Table 20. Summary of Total Employment & Total Labor Income – Cook Inlet Region (2008)

Total Employment				
Industry	Scenario 1 Status Quo	Loss Scenario 2 1.0%	Loss Scenario 2 5.0%	Loss Scenario 2 10.0%
Oil & Gas Production	5,153	52	258	515
Salmon Fishing	709	7	35	71
Seafood Processing (1)	2,453	25	123	245
Sport Fishing	2,345	23	117	234
Port of Anchorage	1,034	10	52	103
Subtotal Current	11,693	117	585	1,169
Chuitna Coal Project	823	8	41	82
Pebble Project	2,351	24	118	235
Subtotal Potential	3,174	32	159	317
Grand Total	14,868	149	743	1,487

Total Labor Income				
Industry	Scenario 1 Status Quo	Loss Scenario 3 1.0%	Loss Scenario 3 5.0%	Loss Scenario 3 10.0%
Oil & Gas Production	$504,503,187	$5,045,032	$25,225,159	$50,450,319
Salmon Fishing	$8,720,507	$87,205	$436,025	$872,051
Seafood Processing (1)	$68,435,155	$684,352	$3,421,758	$6,843,515
Sport Fishing	$75,985,152	$759,852	$3,799,258	$7,598,515
Port of Anchorage	$59,738,090	$597,381	$2,986,905	$5,973,809
Subtotal Current	$717,382,090	$7,173,821	$35,869,105	$71,738,209
Chuitna Coal Project	$62,384,006	$623,840	$3,119,200	$6,238,401
Pebble Project	$177,109,496	$1,771,095	$8,855,475	$17,710,950
Subtotal Potential	$239,493,502	$2,394,935	$11,974,675	$23,949,350
Grand Total	$956,875,592	$9,568,756	$47,843,780	$95,687,559

(1) Net of Salmon Fishing - Since the impact estimates for Seafood Processing includes the backward linkage to fishing, it is expressed as the net of salmon fishing to avoid double counting.

Sources: IMPLAN 2008; RDC study models, 2010.

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Appendices

Appendix A Questionnaire for Resource Development Council of Alaska, Inc. Members

Appendix B Communications Log

Appendix C Annotated Bibliography

Appendix A Questionnaire for Resource Development Council for Alaska, Inc. Members

Resource Dimensions

Economics • Land Use • Natural Resources • Regulatory & Litigation Support

MEMO

To: Jason Brune, Resource Development Council for Alaska, Inc.
From: Julie Ann Gustanski, Resource Dimensions
Date: January 28, 2010
RE: Questions on costs related to Critical Habitat Designation for Cook Inlet Beluga whale

Dear Jason,

The nature of the economic impact analysis we are conducting is a fundamental tool for setting out detailed information about the potential fiscal, economic and socio-economic effects of regulatory measures. In this case we are specifically exploring the nature and extent of impacts attributable to regulatory designation of critical habitat for the Cook Inlet Beluga whale.

The systematic process of questioning early on in the proposed policy cycle facilitates necessary reflection on the important range of details to be taken into account with the proposal of such regulation. To ensure our analysis correctly reflects the range of possible economic and fiscal impacts, it is vital to both understand how the proposed CHD will alter current operations (Status Quo), the breadth of affected parties and the anticipated changes likely to be directly or indirectly associated with designation.

To aid RDC and its partners in evaluating such issues, we present a few key questions below:

1. Did your organization/firm, agency or municipality have compliance related costs in 2008 or 2009 directly related to the Authorization of the Cook Inlet Beluga whale? To assist you in estimating these costs, the list below provides examples of potential costs for complying with the Endangered Species Act/Marine Mammal Protection Act (ESA/MMPA) authorizations.

   Compliance Cost estimate for 2008 $_____
   Compliance Cost estimate for 2009 $_____

   Please list types of costs included in your total estimates above. *Year incurred*

   _____ _____

   _____ _____

   _____ _____

   _____ _____

   _____ _____

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Examples of costs that may be incurred in relation to compliance with MMPA regulations protecting Cook Inlet Beluga whales:

- Costs associated with additional permitting requirements.
- Costs of training of personnel relative to potential incidental take, reporting, etc.
- Costs for conducting surveys, including delay costs until completion.
- Costs for qualified individual(s) for observing reporting effects of activity on CI Beluga whales. Cost should include all costs incurred associated with reviewing and/or development of reports.
- Cost for preparing and submitting any required annual monitoring reports.
- Costs incurred to accommodate NMFS/NOAA observers and any other agency observers.
- Costs associated with travel restrictions.
- Cost of curtailing activities within specified CI Beluga range, including work stoppages, delays, re-routing of activities, etc.
- Cost of creating and fulfilling Plans of Cooperation for Subsistence Hunts.
- Costs of complying with approved reporting requirements, including costs of: training of personnel, work stoppages for harassment activities, documenting and submitting reports of all instances of harassment activities, etc.

2. Has your organization/firm, agency or municipality incurred any costs that are directly related to Section 7 Consultations for Cook Inlet Beluga whales since its listing as a threatened species on October 22, 2008?

   Please enter that amount below:

   $ _____

   Please list types of Section 7 Consultation costs included in the estimate above. *Year incurred*

   _____ _____

   _____ _____

   _____ _____

   _____ _____

   _____ _____

3. How likely do you believe that your organization/firm, agency or municipality will incur significant future costs directly related to Cook Inlet Beluga whale critical habitat, if the proposed designations are approved? Here we are looking to determine your views on the likelihood of additional future costs that *would not* have occurred under current regulations and restrictions promulgated under the MMPA?

   Please tick the response that best captures your view on this.

   ○ Unlikely ○ Somewhat likely ○ Very Likely

4. What is the estimated amount of incremental costs your organization/firm, agency or municipality expects to incur annually in dealing with Cook Inlet Beluga whale critical habitat issues? *Include all costs of project delays and any other anticipated costs that are not currently incurred under existing regulations promulgated under the MMPA.*

   Please enter the estimated amount below:

   $ _____

5. Please identify the factors that you believe will lead to the additional costs that you have indicated in #4 above as a result of critical habitat designations.

Please provide any additional comments that you may have about the proposed Cook Inlet Beluga whale critical habitat designation and/or potential impacts that such designation may bring:

* We welcome any other information pertinent to your organization/firm, agency or municipality that may be helpful to our analysis. Such information may include employment data, facilities (size and nature of operations), research and development investments, technology and infrastructure investments, share of industry information, value of product or services, and other general information that may be helpful to developing a clear picture of the Cook Inlet economy.

Appendix B Communications Log

Representative	Entity	Date interviewed
Doug Vincent-Lang	State of Alaska, Department of Fish and Game	1-Feb-10
Casey Campbell	State of Alaska, Office of Economic Development	1-Feb-10
Multiple	Knik Arm Bridge and Toll Authority (KABATA)	1-Feb-10
Ralph Samuels	Holland America	1-Feb-10
David Hanson	Matanuska-Susitna Borough	1-Feb-10
Dan Graham	PacRim Coal	2-Feb-10
Ethan Schutt	Cook Inlet Region, Inc.	2-Feb-10
Dora Gropp	Chugach Electric Association, Inc.	2-Feb-10
Brad Robertson	North Star Terminal & Stevedore Co.	2-Feb-10
Brett Jokela	Anchorage Water and Wastewater Utility	2-Feb-10
Leo Carroll, Gov. William Sheffield	Port of Anchorage	2-Feb-10
Gary Fandrei	Cook Inlet Aquaculture Association	3-Feb-10
Ricky Gease	Kenai River Sportfishing Association	3-Feb-10
Shanon Hamrick	Kenai Peninsula Tourism Marketing Council, Inc.	3-Feb-10
Rick Koch	Kenai, Alaska	3-Feb-10
Roland Maw	United Cook Drift Association	3-Feb-10
John Torgerson	Kenai Peninsula Economic Development District	3-Feb-10
George Lowery, Caroline Higgins	Totem Ocean Trailer Express	4-Feb-10
Bill Popp	Anchorage Economic Development Corporation	4-Feb-10
Kara Moriarty	Alaska Oil and Gas Association	4-Feb-10
John Hellen	Pioneer Natural Resources Alaska	4-Feb-10

Representative	Entity	Date interviewed
Dave Oliver	TerraSond	4-Feb-10
Jeanine St. John	Lynden Transport	4-Feb-10
Emily Ford	Anchorage Chamber of Commerce	4-Feb-10
Scott Lytle	Ted Stevens Anchorage International Airport	4-Feb-10
Charlotte MacCay	The Pebble Partnership	5-Feb-10
Kip Knudson	Tesoro	5-Feb-10
Heinrich Springer	Springer & Associates	5-Feb-10
Multiple participants	State of Alaska Department of Natural Resources, Division of Oil and Gas	5-Feb-10
Katrina Anderson	Cook Inlet Tug & Barge	9-Feb-10
John Sims	Enstar Natural Gas	9-Feb-10
Bruce Carr	Alaska Railroad Corporation	9-Feb-10
John Shively	The Pebble Partnership	9-Feb-10
Rick Trupp	CGGVeritas	9-Feb-10
Arne Fuglvog	Office of Senator Lisa Murkowski	10-Feb-10
Ron Peck	Alaska Travel Industry Association	10-Feb-10
Tom Harris	Tyonek Native Corporation	11-Feb-10

Appendix C Annotated Bibliography

Cost Benefit Analysis

Alban, F., G. Appéré, et al. (2006). Economic analysis of marine protected areas: A literature eview. EMPAFISH Project. Brest, France, Université de Bretagne Occidentale - CEDEM**:** 51.

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These authors estimate the economic impact of the Stellar sea lion conservation area upon the Bering Sea pollock fishery.

Kuronuma, Y. and C. A. Tisdell (1994). Economics of Antarctic inke whale catches: Sustainability and welfare considerations. Marine Resource Economics 9(2): 141-158.

Clark's bioeconomic model is applied to Antarctic minke whales (AMW), the backbone of the commercial whaling industry, in 1982 when the International Whaling Commission (IWC) opted for a ban on whaling commencing 1985-86. The moratorium appears not to be justified from the point of view of saving AMW from extinction or for maximising the net present value of returns to whalers. Catch quotas before the moratorium are found to be lower than needed for survival of the species and for sustainability of the harvests and returns.

Smith, M. D. and J. E. Wilen (2003). Economic impacts of marine reserves: the importance of spatial behavior. *Journal of Environmental Economics and Management* **46**(2): 183-206.

The cost-benefit analysis done for the CHD of Cook Inlet beluga whales states that commercial fisheries will benefit from the CHD. This assumes that the fishing effort is fixed and uniformly distributed, and therefore an increase in fish inside the CHD will increase fish outside the CHD in order

to compensate for losses in foregone potential. This fails to take into account that it is not enough that a reserve increases harvest outside the reserve, but rather that the increase be large enough to compensate for the area removed from fishing.

Industry Issues

Alaska Department of Natural Resources Division of Oil and Gas (2007). 2007 Oil and Gas Report. Anchorage, AK.

This report gives historical and projected data on oil production in the Cook Inlet.

Alaska Department of Natural Resources Division of Oil and Gas (2010). State of Alaska Five-Year Program of Proposed Oil and Gas Lease Sales. Anchorage, AK.

This report projects possible oil and gas lease for the next five years.

Alaska Mining Industry Association, Inc. (2009). The economic benefits of Alaska's mining industry. January 2009.

This three page fact sheet provides an overview of the mining industry economic benefits to the State of Alaska and its denizens.

Hartz, J. D., M. C. Kremer, et al. (2009). Preliminary engineering and geological evaluation of remaining Cook Inlet gas reserves. Alaska Division of Oil and Gas. Anchorage, AK.

This report gives an estimate of remaining Cook Inlet gas reserves and also has some data about historical production.

Information Insights and McDowell Group (2008). The role of the oil and gas industry in Alaska's economy.

A study about the overarching effects of the oil and gas industry on the state's economy and the taxes and royalties paid to the state's general fund.

Pebble Partnership, The (2009). Facts at a Glance. The Pebble Partnership, June 2009.

This two page fact sheet provides a cursory overview of the Pebble Mine.

Popp, B. (2005). Cook Inlet Oil & Gas 2004 Annual Report. Soldotna, AK, Kenai Peninsula Borough Oil and Gas Office.

This report gives some figures for the production of natural gas in the borough and also gives a view at some of the oil companies operating in the Cook Inlet and their wells.

Sherwood, K. W. and J. D. Craig (2001). Prospects for Development of Alaska Natural Gas: A Review, U.S. Department of the Interior.

This report states: "*Three percent (0.92 tcf) of Alaska's exportable gas reserves occur within fields in the Cook Inlet basin of southern Alaska and are at present dedicated to future LNG exports to Japan. Cook Inlet has 2.56 tcf in total remaining gas reserves, most of which is used locally or converted to fertilizer feedstock. At present rates of consumption, all Cook Inlet gas reserves will be depleted by year 2012.*"

Taylor, A., C. Severson-Baker, et al. (2004). When the government is the landlord - Appendix II: Regional Details - Alaska. Calgary, Canada, The Pembina Institute.

This appendix of a larger report gives some good general numbers for production and values of the resources produced. The source for the cost of production come from personal communications with the Alaska government.

U.S. Department of the Interior Minerals Management Service (2006). Undiscovered Oil and Gas Resources, Alaska Federal Offshore. Anchorage, AK, Alaska OCS Region.

This report gives a value for the undiscovered and recoverable gas, and breaks down the amount of gas recoverable into amounts that are economically recoverable given different price levels.

Non-Market Evaluation

Common, M., I. Reid, et al. (1997). Do existence values for cost benefit analysis exist? Environmental and Resource Economics 9(2): 225-238.

This article shines light on problems associated with the inclusion of existence values into cost-benefit analysis.

Goldsmith, S. (2000). A preliminary investigation of the economic effects of critical habitat designation for the Spectacled Eider and Steller's Eider on Alaska's North Slope. University of Alaska-Anchorage, Institute of Social and Economic Research.

This report provides comments on the U.S. Fish and Wildlife Service Draft Economic Analyses of Critical Habitat Designation for the Spectacled Eider and Steller's Eider, and evaluates the Potential Economic Cost and Economic Impact to the Petroleum Industry and the Nation from Critical Habitat Designation for the Spectacled Eider and Steller's Eider on Alaska's North Slope.

Loomis, J. B. and D. M. Larson (1994). Total economic values of increasing gray whale populations: Results from a contingent valuation survey of visitors and households. Marine Resource Economics 9(3): 275-286.

Willingness-to-pay (WTP) responses for increases in the population of gray whales was conducted using contingent valuation. WTP surveys were given to respondents who had just returned from whale watching activities in California. The results suggest that citizens do derive a benefit from having a larger stock of whales, but opportunity costs are not considered. This paper was cited in the 2009 CHD for the Cook Inlet beluga whale.

Loomis, J. B. and D. S. White (1996). Economic benefits of rare and endangered species: Summary and meta analysis. *American Journal of Agricultural Economics* **78**(5): 1407-1407.

This paper is a meta-analysis of several contingent valuation studies that were performed to assess the economic value of rare and endangered species. This paper was cited in the CHD for the Cook Inlet beluga whale.

Development and Alaska Native Issues

Mahoney, B. A. and K. E. W. Shelden (2000). Harvest history of belugas, *Delphinapterus leucas*, in Cook Inlet, Alaska. *Marine Fisheries Review* **62**(3): 124(110).

A history of the number of whales hunted during the subsistence hunts from the 1930s to early 2000s is given.

Wolfe, R. J. and R. J. Walker (1987). Subsistence economies in Alaska: Productivity, geography, and development impacts. *Arctic Anthropology* **24**(2): 56-81.

This dated publication gives a breakdown of the harvests of natural resources by native populations by area, community, and type of resource. It breaks down the relative importance of subsistence hunts to native communitities by geographic area.

Commercial and Sport Fishing Impacts

Alaska Department of Fish and Game (2009). 2009 Commercial Salmon Fishery. New release issued November 17, 2009 by the Division of Commercial Fisheries.

This news release details the 2009 fishery for several salmon stocks, including sockeye, coho, pink, chum, and chinook.

Hamel, C., H. T. Geier, et al. (2002). Linking sportfishing trip attributes, participation decisions, and regional economic impacts in Lower and Central Cook Inlet, Alaska. *The Annals of Regional Science* **36**(2): 247-264.

This model links changes in individual participation decisions for the Cook Inlet salmon and halibut catches as a function of regulatory changes. The probability that an individual will take a particular recreational trip is described using a nonlinear random effects probit model based on variable trip attributes and individual economic and demographic characteristics. These conditional individual probabilities are transformed into predictions of changes in total recreation demand using a simulation-based sample enumeration method.

Hamel, C., M. Hermann, et al. (2000). An economic discussion of the marine sport fisheries in Central and Lower Cook Inlet. *International Institute for Fisheries Economics and Trade*. Covallis, OR.

This paper reports on the valuation of the marine halibut and salmon sport fishery of central and lower Cook Inlet, Alaska. The total estimated new money brought into the Kenai Peninsula as a result of 259,615 saltwater angler days in central and lower Cook Inlet was $37.4 million in 1997, and the total compensating variation, $25.4 million. This paper was cited in the 2009 CHD of Cook Inlet beluga whales.

Herrmann, M., S. T. Lee, et al. (2001). A survey of participants in the Lower and Central Cook Inlet halibut and salmon sport fisheries." *Alaska Fishery Research Bulletin* **8**(2): 107-117.

Postal surveys were conducted of participants in the 1997 halibut and salmon fishing seasons in the Lower Cook Inlet. Non-residents accounted for 44% of all participants. An estimated $34.1 million is attributable to the fisheries. $24.9 million was money spent by non-residents in 1997, $22.3 million and $23.5 million of non-resident spending in 1998 and 1999, respectively. This paper was cited in the 2009 CHD of Cook Inlet beluga whales.

Howe, A. L., G. Fidler, et al. (1998). Harvest, catch, and participation in Alaska sport fisheries during 1997. *Fishery Data Series 98-25*. Alaska Department of Fish and Game. Anchorage, AK.

A state wide survey of participants in 1997 harvest of fish was conducted. The Cook Inlet area had 1,324,675 total fishing days, which was 50% of the state's total sportfishing. Results are given by area and by species fished. Several years of results are given.

Other Impacted Entities

Colt, S. and N. Szymoniak (2008). Benefit-cost assessment of the Port MacKenzie rail extension. University of Alaska – Anchorage, Institute of Social and Economic Research. Prepared for Matanuska-Susitna Borough.

This study addresses the benefits and cost of the proposed Port MacKenzie rail extension.

Goldsmith, S. and M. Killorin (2007). Ted Stevens Internation Airport: Economic Significance 2007. University of Alaska – Anchorage, Institute of Social and Economic Research. Prepared for Ted Stevens International Airport.

This study investigates the details of wage and salary jobs associated and related to Ted Stevens International Airport for 2007.

Insight Research Corporation (2007). Knik Arm Toll Bridge Anchorage Alaska MSA Traffic and Toll Revenue Investment Grade Study. Independent economic review and development forecast. Prepared for Wilbur Smith Associates.

This study examines and forecasts the expected population, employment, and economic impacts in the Anchorage and the Matanuska-Susitna Borough under two development options: with and without the Knik Arm Toll Bridge.

Metz, P. (2007). Part I. Economic analysis of rail link Port MacKenzie to Willow, Alaska. Part II. Possible rail extension users analysis. Submitted to Matanuska-Susitna Borough.

This study compares the net present value savings on rail freight against the capital cost of the proposed project.

Prokop, D. (2007). The economic impact and logistics of the Port of Anchorage. University of Alaska-Anchorage, College of Business & Public Policy.

This paper outlines the economic impact of the Port of Anchorage in the midst of its expansion project and in anticipation of a new revenue bond.

Szymoniak, N. and S. Colt (2009). Benefits of the Cook Inlet Ferry to the Municipality of Anchorage. University of Alaska – Anchorage, Institute of Social and Economic Research. Prepared for the Matanuska-Susitna Borough Economic Development Department.

The purpose of this study is the examine the economic benefits of the Cook Inlet Ferry to the Municipality of Anchorage, that is expected to be operational by 2010. It will provide regular ferry between Anchorage and Port MacKenzie.