



SERVICES CONTRACT

Contract No. SC 15-42 with Amendment 1

This Contract is between the State of Washington Department of Natural Resources, referred to as the DNR, and Cascade Economics, referred to as the Contractor, for the express purposes described in the following provisions of this Contract.

The purpose of this Contract is to develop sound economic information through an economic analysis that enables a deeper understanding of the elements of the ocean economy to assist the development of the Marine Spatial Plan for Washington's Pacific Coast.

The Contractor shall produce the following:

- Workshop to present scoping elements and refine proposed scope of work
- Summary of scoping activities, including process used to recommend and select an approach (by November 1, 2014)
- Draft economic analysis (by April 15, 2015)
- Attend and present findings at WCMAC meeting (approximately April 22, 2015)
- Present final report at WCMAC meeting (approximately June 24, 2015)
- Prepare and deliver final report (by June 30, 2015)
- Detailed summary of progress reports (monthly, with invoice)
- Monthly coordination conference calls with the Project Manager

All required products must be delivered to the DNR Project Manager. All oral reports must be presented at the location requested by the DNR.

SCOPE OF WORK

Overview

The work plan for this study is presented below. Much of the initial work plan involves working with the WCMAC and the science advisory committee to develop and refine the scope of the economic analysis. We have created three broadly defined approaches to economic analysis, consistent with the desired “menu of approaches.” The discussion below provides the details associated with each of the approaches, including their formulation, outcomes, strengths, and weaknesses.

Task 0 – Kickoff Meeting with DNR

Our project team believes that a kickoff meeting is an important element to this study. Dr. Taylor, Ms. Baker, and Dr. Waters will meet with the DNR or other designees with technical interest and oversight responsibility for the study. Mr. Wegge will attend by conference phone. We can provide a proposed agenda prior to the kick-off meeting. The purpose of the meeting will be to:

- ◆ clarify project objectives and initial thoughts on research procedure;
- ◆ discuss the role of the project within overall MSP goals and objectives;
- ◆ identify or obtain previously assembled materials, project-related resources, completed sector analyses (if available), and lists of contact names of WCMAC and science advisory panel members; and
- ◆ discuss any proposed refinements to the approach to developing the scope of analysis.

If revisions to our approach or proposed work product are agreed upon, Dr. Taylor will provide a memorandum describing the revised plan to DNR.

Task 1 – Initial Background Research and Scoping Activities

For this task, the study team will initiate the research project by collecting available information; consult with the WCMAC, state staff, and science advisory committee; and recommend and design a scope of work. This includes the following subcomponents:

1. Perform initial background research: This entails collecting and reviewing available reports and other documents in order to develop a basic overview of the coastal economy.
2. Prepare for and conduct a half-day workshop, assumed to be held in Aberdeen, on the menu of options and elements of an economic analysis. This will include:
 - a. a detailed dialogue of the goals and objectives and anticipated outcomes of an economic analysis;
 - b. available tools and models that are appropriate for developing output;
 - c. forms and types of output, and degree of precision in estimate and by location, within each;
 - d. data needs and requirements, with an emphasis on key sectors, including commercial fishing, aquaculture, recreation and tourism, and shipping;
 - e. development of data and incorporation of coastal tribal economies in the analysis; and
 - f. design of an economic analysis that balances the needs of the planning process with the timeline and budget available for data development and analysis.

3. Prepare an initial scoping document with recommendations for the economic analysis. Work with state staff to refine and further articulate components where necessary.
4. Participate in follow up conference calls with members of WCMAC, as necessary, to respond to inquiries or comments on the proposed scope.
5. Prepare a summary scoping document for the record of the planned economic analysis.

The process used to develop, refine, and recommend an economic analysis involves a series of steps. Following the completion of initial background research, team members will contact knowledgeable members of the WCMAC, state staff, and science advisory committee to discuss details about data availability and gaps, data sources, and key elements of the study components. With this information on hand, the team will devise a workshop for the full committees and staff. The workshop will be organized around a presentation of the options and elements of an economic analysis, including the details of the three levels of study. Armed with an understanding of data requirements and availability, the team is better able to answer questions or respond to suggestions about changes or revisions to research work plan elements. In addition, the team can provide feedback on the strengths and weaknesses of particular features of the study at different levels.

Based on input gained from the workshop, the team will reconvene and develop a proposed scope of work. The scope of work will be reviewed by the science advisory committee, state staff, and their designees. This is likely to be enabled by targeted conference calls with committee members and/or state staff. The review will ultimately result in comments and suggestions for refinements, to which the team will prepare responses and/or revisions to the scope of work.

The team will then prepare a summary scoping document to memorialize the approach selected. This will include a rationale for its selection.

Task 2 – Conduct Economic Analysis and Prepare Draft Report

In this task, the team will conduct the economic analysis of proposals in the Marine Spatial Planning effort. The goal of this effort is to develop information that can be used to forecast anticipated changes in economic activity for the Washington coast, as well as individual locations within the coastal area. Furthermore, it will provide quantitative information on economic sectors that will benefit (increase) or lose (decrease) as a result of the proposal. The economic consequences will be demonstrated through direct, indirect, and induced impacts on total sales (by location and sector), personal income, and employment. The study team is cognizant of the data required for a properly prepared, objective economic analysis and has the experience and capability to collect, report, and qualify the reliability of the results.

The team will prepare draft reports for review by the WCMAC representatives and a core group of experts or other reviewers as identified by the state. In conjunction with, and probably about two weeks after submittal of, the draft report, the team will attend and present key findings of the economic analysis to the WCMAC.

Task 3 – Prepare Final Economic Analysis Report

The study team will review comments from the reviewers of the draft report. It is anticipated that reviewers will require up to four weeks before submitting comments to the study team. Comments

leading to revisions in the report will be incorporated as appropriate. Additionally, some comments may require further discussions with the science advisory committee and/or WCMAC.

All four members of the study team will attend and present a summary of the final economic analysis to the WCMAC.

The final report will be provided to the DNR no later than June 30, 2015.

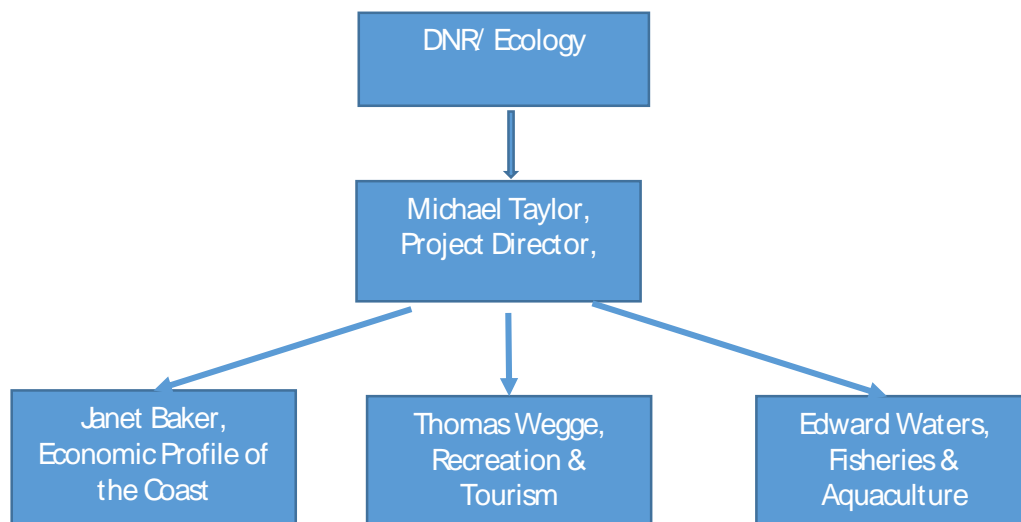
Plan to Accomplish Tasks

Description of Plan

The Organizational Chart in Figure 1 displays the anticipated coordination of efforts that will be followed in order to complete this study for the DNR. Dr. Michael Taylor will serve as the Project Director and the primary contact for the study team. He will be responsible for technical coordination among the team members and for ensuring that the DNR receives satisfactory products.

- Dr. Waters will lead the scoping for the analysis of commercial and tribal fisheries, and will be assisted by Mr. Wegge on recreational fishing, and by Dr. Taylor with respect to the processing component.
- Dr. Waters will lead the scoping of the aquaculture sector modeling.
- Ms. Baker will lead the scoping of the profile and trends of the Washington coast
- Dr. Taylor will lead the scoping of the tribal economic profile.
- Mr. Wegge will lead the scoping for the recreation and tourism sectors. Ms. Baker and Dr. Taylor will provide assistance.

Figure 1: Project Organizational Chart



Project Management

The project team consists of Dr. Michael L. Taylor, Dr. Edward Waters, and Ms. Janet Baker of Cascade Economics LLC, and Mr. Thomas Wegge of TCW Economics. Dr. Taylor will serve as the Project Director and the primary contact for the study team. He will be responsible for technical coordination among the team members and for ensuring that the DNR receives satisfactory products.

Dr. Taylor will lead the “Tribal Economy” research, and will also serve in a support role on commercial fishing and recreation and tourism. By serving in this capacity, he can ensure consistency in the format, level of detail, and flow of the reporting. Within the study team, each member has a specific role and provides a unique perspective.

- Dr. Waters will lead the research of the commercial (tribal and non-tribal) fishing sector and the aquaculture sector.
- Ms. Baker will lead the research of the economic profile of the Washington coast. She will also provide a support role on the recreation and tourism research.
- Mr. Wegge will lead the research on recreation and tourism, and will provide support on recreational fishing.

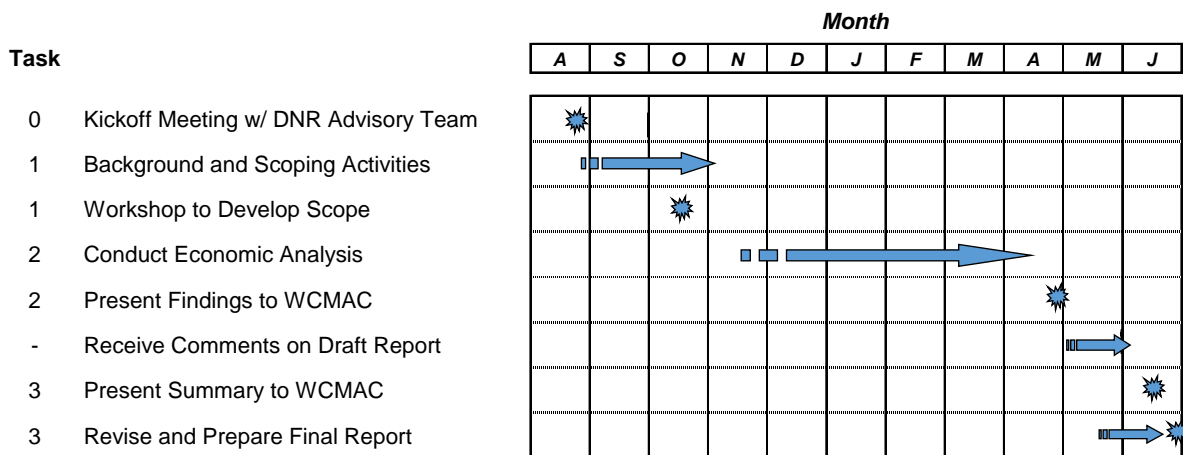
Proposed Schedule

The timeline that is anticipated for this project has an ultimate deadline for a final report by June 30, 2015, approximately ten months after the contract. The timeline is displayed in Figure 2. Interim deliverables are shown in the timeline, and the final deliverable remains the same as in the RFP.

Figure 2

Design and Implementation of an Economic Analysis to Support Marine Spatial Planning in Washington

Proposed Timeline



Menu of Approaches for Economic Analysis: A Comparison Summary

The components that make up an economic analysis will vary by the identified needs of the study, proposals being investigated, required precision of output, sectors or groups of particular interest or emphasis, locations being examined, data availability and delivery, timeline, and budget available. Because so many elements must be balanced in order to frame an appropriate economic analysis, we have developed a summary comparison of three bundled packages, as shown in Table 1. The three packages represent different levels of investment in studies, each yielding a different set of output estimates that vary in precision and reliability.

Summary information about particular components as they relate to each study level is shown across the rows in Table 1. The categories of components are oriented to addressing points raised by the Technical Committee in Exhibit D of the RFP, plus some additional components that our team believes are useful or necessary in this economic analysis. Details on a number of these components are outlined in subsections following Table 1, along with a summary of advantages and disadvantages of the respective approaches.

In the course of the scoping process, it is possible – even appropriate – to select component elements from different levels of study, depending upon the WCMAC’s focus or emphasis, in order to devise a targeted scope of work.

Table 1 - Economic Impact Studies Comparison Matrix

Item	Level I Study	Level II Study	Level III Study
Strengths	<ul style="list-style-type: none"> • Quickest implementation. • Data already exists. • Advantageous if budget is limited. 	<ul style="list-style-type: none"> • County-level impact estimators specifically designed for the study region. • Most data already exists. 	<ul style="list-style-type: none"> • Impacts fine-tuned for individual communities in the study region. • Most accurate representation of sectors and local economies.
Weaknesses	<ul style="list-style-type: none"> • “Off-the-shelf” so accuracy may suffer. • Finer-level activity and geographic detail may not be available. 	<ul style="list-style-type: none"> • May require access to confidential business data. • Relies on existing data but some interviews required. 	<ul style="list-style-type: none"> • May require access to confidential business data. • Data needed for fine-tuning must be collected via interviews. • Most time-consuming implementation.
Economic Profile of the Coast	<ul style="list-style-type: none"> • Research and provide narrative profile of economic base. Rely on existing publications. • Socioeconomic data from US census, REIS, BEA, WA Employment Security. • Incorporate information from Sector Analyses. 	<ul style="list-style-type: none"> • Research and provide profile of economic base, coast-wide and by county. • Socioeconomic data from US census, REIS, BEA, WA Employment Security. • Incorporate information from Sector Analyses. • Research and discuss trends affecting coastal economy. 	<ul style="list-style-type: none"> • Research and provide profile of economic base, coast-wide and by county. • Socioeconomic data from US census, REIS, BEA, WA Employment Security. • Incorporate information from Sector Analyses. • Research and discuss trends affecting coastal economy;

Item	Level I Study	Level II Study	Level III Study
			research and forecast near-term economic conditions for major sectors.
Economic Profile of Tribal Communities	<ul style="list-style-type: none"> • Research and provide socioeconomic profile of Quinault, Quileute, Hoh, Shoalwater Bay, and Makah Tribes, based on published sources. 	<ul style="list-style-type: none"> • Research and provide socioeconomic profile of Quinault, Quileute, Hoh, Shoalwater Bay, and Makah Tribes. Use published sources, plus direct interviews with the Tribes. • Discuss economic relationship of Tribes within coastal community. 	<ul style="list-style-type: none"> • Research and provide socioeconomic profile of Quinault, Quileute, Hoh, Shoalwater Bay, and Makah Tribes. Use published sources, plus direct interviews with the Tribes. • Discuss economic relationship of Tribes within coastal community. • Research and discuss trends affecting tribal economy; research and forecast near-term economic conditions for major sectors.
Economic Impact Analysis Measures	<ul style="list-style-type: none"> • Document and use published industry impact multipliers. • Quantitative direct impact estimates apply coast-wide, with qualitative discussion relating to localized impacts. 	<ul style="list-style-type: none"> • IMPLAN model (five counties, plus region), with minor adjustments to source data. • Model and data turned over to DNR. 	<ul style="list-style-type: none"> • IMPLAN model (five counties, plus region and state), with significant adjustments to source data. • Direct business interviews in order to make adjustments to RPCs. • Model and data turned over to

Item	Level I Study	Level II Study	Level III Study
			DNR.
Regulatory and Policy Decision Impacts	<ul style="list-style-type: none"> Work with Technical Committee, provide qualitative analysis of impacts of several “key decisions.” 	<ul style="list-style-type: none"> Work with Technical Committee, provide quantitative estimate of impacts of several “key decisions.” 	<ul style="list-style-type: none"> Work with Technical Committee, provide quantitative analysis of impacts of several “key decisions.”
Estimate Impacts of Potential Uses	<ul style="list-style-type: none"> Provide qualitative and, if possible, quantitative estimates of impacts of up to 5 potential uses identified by Technical Committee 	<ul style="list-style-type: none"> Provide quantitative estimates of impacts of up to 5 potential uses identified by Technical Committee. 	<ul style="list-style-type: none"> Provide quantitative estimates of impacts, by county and region, of up to 5 potential uses identified by Technical Committee.
Ecosystem Services	<ul style="list-style-type: none"> Discuss general concepts, identify coastal sites that are providers of relatively high level of ecosystem services. 	<ul style="list-style-type: none"> Discuss general concepts, provide examples of valuation within the state, and identify coastal sites that are providers of relatively high level of ecosystem services. 	<ul style="list-style-type: none"> Discuss general concepts, provide examples of valuation within the state, and identify coastal sites that are providers of relatively high level of ecosystem services. Identify data needs required for a site specific valuation.
Commercial Fishery Profile of the Coast	<ul style="list-style-type: none"> Research and develop profile of major or significant fisheries by species, ports of landing, and processors. Include discussion of trends by major species. 	<ul style="list-style-type: none"> Research and develop profile of commercial fisheries by species, ports of landing, processors, market forms and markets. Include discussion of trends, including data by port. 	<ul style="list-style-type: none"> Research and develop profile of commercial fisheries by species, ports of landing, processors, market forms and markets. Include discussion of trends, including data by port. Update IMPLAN models to incorporate FEAM profiles and

Item	Level I Study	Level II Study	Level III Study
			new survey data.
Tribal Fisheries and Ports	<ul style="list-style-type: none"> Provide profile of tribal fisheries and ports based on published information. 	<ul style="list-style-type: none"> Provide profile of tribal fisheries and ports based on published information and interviews with tribal fisheries managers. 	<ul style="list-style-type: none"> Provide profile of tribal fisheries and ports based on published information and interviews with tribal fisheries managers. Include details as available related to tribal fish markets and hatchery operations.
Estimate Impacts of Potential Uses on Fisheries	<ul style="list-style-type: none"> Include qualitative and, if possible, quantitative impacts on commercial fisheries of proposed uses identified above 	<ul style="list-style-type: none"> Include quantitative impacts by location on commercial fisheries of proposed uses identified above 	<ul style="list-style-type: none"> Include quantitative impacts by location on commercial fisheries of proposed uses identified above
Profile of Commercial Aquaculture	<ul style="list-style-type: none"> Develop profile of aquaculture production, processing, and markets. Incorporate sector analysis. 	<ul style="list-style-type: none"> Develop profile of aquaculture production, processing, and markets, including future trends. Incorporate sector analysis. 	<ul style="list-style-type: none"> Develop profile of aquaculture production, processing, and markets, including future trends. Incorporate sector analysis. Update IMPLAN models to incorporate new survey data, which can be used to estimate impacts to this sector.
Estimate Impacts of Potential Uses on Aquaculture	<ul style="list-style-type: none"> Include qualitative and, if possible, quantitative impacts on aquaculture of proposed uses identified above 	<ul style="list-style-type: none"> Include quantitative impacts by location on aquaculture of proposed uses identified above 	<ul style="list-style-type: none"> Include quantitative impacts by location on aquaculture of proposed uses identified above

Item	Level I Study	Level II Study	Level III Study
Recreation Sector	<ul style="list-style-type: none"> Research and develop profile of recreation on the coast, including activities and participation rates and trends, based on published information. 	<ul style="list-style-type: none"> Research and develop profile of recreation on the coast, including activities and participation rates and trends, based on published information. Incorporate Surfrider study of recreation participation. Research and incorporate published spending profiles by activity in order to estimate baseline and impacts 	<ul style="list-style-type: none"> Research and develop profile of recreation on the coast, including activities and participation rates and trends, based on published information. Incorporate Surfrider study of recreation participation. Research and incorporate published spending profiles by activity in order to estimate baseline and impacts
Tourism Industry	<ul style="list-style-type: none"> Research and develop profile of tourism on the coast, based on published information and incorporating information from sector analysis. 	<ul style="list-style-type: none"> Research and develop profile of tourism on the coast, based on published information and incorporating information from sector analysis. Research future trends, incorporating broader regional or national research on participation. 	<ul style="list-style-type: none"> Research and develop profile of recreation on the coast, including activities and participation rates and trends, based on published information. Research future trends, incorporating broader regional or national research on participation
Social Impact Analysis	<ul style="list-style-type: none"> Provide social impact information based on recent community profiles by NOAA and PFMC in EISs 	<ul style="list-style-type: none"> Provide social impact information based on NOAA research, addressing effects by port or community if possible. 	<ul style="list-style-type: none"> Provide a NOAA guidelines-based “social impact analysis,” as practical, by port and community of each proposed use. Identify data requirements for a

Item	Level I Study	Level II Study	Level III Study
			fully compliant analysis.

Amendment Overview

The Economics Team conducted a Workshop with the Washington Coast Marine Advisory Committee (WCMAC) and other interested members of the public on October 7, 2014, where an overview of each of the components were presented, including discussion of what would be included in analyses of different levels. Questions, comments, suggestions, and other feedback were received at the Workshop, and later in writing by some participants or others not in attendance but able to review materials and a video of the Workshop. The Economics Team considered these comments and suggestions, and prepared a detailed Scope of Work to address the spectrum of needs and interests that fit within the overall realm of the MSP requirements. This scope was provided to the Science Panel on October 15. The Economics Team participated in a discussion with representatives of the Science Panel on October 17, who provided some suggestions for refinement. Final written comments will be forthcoming, *but are not expected to alter the detailed scope in a significant manner*. Finally, the Lead Economist presented the proposed scope to the WCMAC on October 22, 2014, which provided some additional suggestions that are incorporated herein.

The following Scope of Work contains the substance of the tasks, deliverables, and timeline for the Economic Analysis. The detailed methodologies will be included in a subsequent document and will incorporate feedback from the Science Panel.

Task 1 – Economic Profile of the Washington Coast

Current Conditions

The basic profiles of the four coastal counties will include economic and demographic information. Much of the data will only be available at a county level. However, to the extent possible, profiles of the coastal parts of the respective counties will be presented separately.

The previously prepared sector reports covered four important sources of economic activity on the Washington coast – shipping, fishing, aquaculture, and recreation and tourism. However the economy on the coast is driven by more than just those four sectors. Information on other important sectors, e.g., forestry, will also be incorporated into the economic profile.

Preparation of the economic profile will draw from the four sector reports, as well as other existing documents. The initial step in this task will be to identify and review all relevant existing as well as ongoing economic research related to the Washington coast. This review will include ongoing as well as completed MSP projects, plus research conducted outside the MSP process.

In addition to the studies mentioned above, much of the primary data for the profiles will come from published government sources. These include:

- U.S. Census Bureau data on housing, population by age class, employment, ethnicity for the county.
- Bureau of Economic Analysis, Regional Economic Information System (REIS) data on sector- based production and personal income.
- City, county or state level updates to the Census data or more localized estimates of demographics or other social economic statistics.
- County Business Patterns data

- Washington Department of Revenue data on tax receipts for study area businesses.

New research conducted as part of this new work, in particular economic data for commercial (non-tribal and tribal) fisheries, recreation and tourism, and aquaculture, will also contribute to the economic profile. In particular, employment estimates developed as part of this study may replace the standard government published data.

Trends Affecting the Coastal Economy

Given that the MSP covers a 20 year planning horizon, additional information is needed about economic and demographic trends for the Washington coast. Data on economic trends in key parts of the coastal economy will be developed in part from the original sector reports, other published reports as well as new sector research conducted in other parts of this study. Trends in population, age distribution, and income will come from historical data and projections by respective national and state agencies involved in collecting and analyzing these statistics.

It is anticipated published information about the coastal economy may not be sufficient to identify all trends relevant to the MSP effort. For this reason the published information will be supplemented by a series of interviews with key players in different parts of the coastal economy to determine significant trends in their respective sectors and geographies. These would include, but not be limited to, interviews with port officials, representatives in the fishing and aquaculture industries, and natural resource department staff at federal, state and county agencies who are experts on trends in recreation/tourism. In addition we anticipate conducting interviews with representatives in industry sectors outside the key sectors addressed in the previous MSP project. For example, while the wood products industry currently plays a smaller role than it did historically, it is still an important economic factor on the coast. Contact with county/city economic development staff will help us incorporate their insights into important broader trends in their respective geographies.

20 Year Forecasts

Key informant interviews will be supplemented by examination of broader trends – demographic, technological, economic, and climate change – in the State of Washington and the U.S. as a whole that are likely to affect conditions in the coastal communities, beyond what communities themselves can impact. In addition, planned capital improvements would be reviewed for projected changes in public and private infrastructure that would result in additional revenue and employment on the coast.

Task 2 - Economic Profile of Tribal Communities

As a first step, existing, available data and literature will be used to prepare a socioeconomic profile of each of the five tribes on the coast. The U.S. Census provides information presented on a reservation-wide basis. Some additional information is available from public sources, tribal websites, and Bureau of Indian Affairs field offices (Makah Agency, Olympic Peninsula Agency, and Taholah Agency) but in general it is anticipated the detailed data required to present an economic and demographic profile for the five tribes will not be available from public sources. Also Census data is often not accurate for small population communities like those in reservations on the Washington coast.

The most comprehensive and complete data are available from the tribes directly. Additional demographic and economic information has been offered to this process voluntarily by the Tribes. Collection of additional data would entail arranging for and visiting each tribe's center of government to

seek permission to obtain more detailed demographic, socioeconomic, and commerce data. This is typically through a request or possibly a presentation to the Tribal Council or Tribal Chair. Any clearance granted would permit government staff to provide data accordingly.

Trends Affecting Tribal Economies

Collection of information to determine economic trends anticipated on the reservations would be complementary to the process used for the non-tribal coastal communities on the coast but is more likely to depend on personal interviews than on published sources. These would include interviews of tribal economic development staff and managers of tribal businesses as well as other contacts suggested by the tribes.

As discussed in the non-tribal section above, broader trends that are likely to affect the tribal economy, including conditions affecting Washington and the U.S. economies, will also be factored into the trends section.

Task 3 – Economic Impact Modeling Approaches and Measures

IMPLAN (<http://implan.com/>) will be used to construct regional economic impact models of the coastal region under the Level III analytical approach. Under the Level III approach, state-level models of the Washington State economy will also be constructed and used to estimate contributions and impacts of coastal activities on the state as a whole.

All impact multipliers used in the economic analysis under the Level III approach will be derived from economic models specifically constructed from recent economic data and calibrated to represent economies in the study region. IMPLAN data for the Washington coastal counties will be purchased and models of a Coastal Region consisting of Pacific, Grays Harbor, Jefferson, and Clallam (and possibly Wahkiakum) counties will be constructed. Some basic verification of the data in the models will be done by checking industry employment and/or payroll totals underlying the IMPLAN models with county-level employment and payroll estimates from sources such as the U.S. Census Bureau County Business Patterns, U.S. Bureau of Labor Statistics, U.S. Bureau of Economic Analysis, and Washington State Employment Security Department. Spending levels associated with current or projected activity levels in the key sectors will be estimated and distributed among receiving industries according to expenditure profiles (percentage distributions) adapted from other relevant economic impact studies. The resulting expenditure distributions for each activity will be applied to the corresponding regional economic models to generate estimates of the economic contribution or total impact of the activity on the economies of the study areas.

Level III Approach

All impact multipliers under the Level III Approach will be derived from custom-built economic impact models. Under the Level III Approach additional time and effort will be committed to validating and calibrating data in the basic models so as to more accurately reflect actual economic conditions in the study area economies. Enhanced data on local supply, demand and purchasing patterns will be gathered from interviews with key industry informants in the study area communities. For example, participants in the key industry sectors will be interviewed to identify the locations of their input suppliers and places of residence of their workforce. These factors are the key considerations in determining the magnitude of local economic multiplier effects. Information from these contacts and interviews will be used to adjust

underlying industry purchasing patterns in the economic models including industry purchases of goods, services and labor inputs. This process will improve the depth and accuracy of economic impact estimates.

Estimating Industry Economic Contributions and Economic Impacts

This study will estimate economic contributions and incremental economic impacts of the key marine resource-related industries or sectors. Information will be prepared as ranges in order to best characterize the relative precision of the results. Models of the economic relationships between industries, households and other institutions will be constructed using IMPLAN and ground-truthed using available published data and information gleaned from interviews with key informants. Feedback received during the scoping workshop in Montesano on October 7, 2014 leads us to believe that in addition to local regional models, a state-level model is also needed to capture the economic relationships between marine resource-related sectors of the Washington coast and the rest of the Washington state economy.

Economic models will need to be tailored specially for analysis of each sectors' economic contributions and also for the analyses of each economic impact or new alternative use scenario. Certain scenarios may entail a projected increase in activity in a given sector while simultaneously contributing to a reduction in activity for other sectors.

Once the necessary regional economic data has been collected and estimated for each Washington Coast marine resource sector, the models will be used to (1) estimate the economic contributions of each marine resource-related sector to the Washington coastal economies; and (2) estimate economic contributions of each resource-related sector to the Washington state economy. In addition once the defined hypothetical alternative resource use scenarios have been defined, the models will be used to (3) estimate economic impacts of the hypothetical resource use scenarios on coastal economies; and (4) estimate economic impacts of the hypothetical resource use scenarios on the overall Washington state economy.

In addition, information and assumptions about emerging trends in key industries, development plans for Washington Coast infrastructure, and inferences about the likely direction of regional and international economic trends will be used to illustrate our best guess at the longer-term effects of the hypothetical resource use scenarios on the Washington coastal economies and the state of Washington.

The following is a list of definitions of regional economic impact modeling terms and concepts:

Direct Effects: The expenditures, employment levels, and activities of the industry in question.

For example, the direct employment in the shellfish aquaculture industry includes all of the employees of the aquaculture firms.

Economic Contribution: The economic contribution of an industry or sector describes the portion of a region's economy (output, employment and income) that can be attributed to that sector's activities.

Economic Impact: An economic impact, in contrast, examines the effects of a marginal change in the level of activity of a particular industry or sector.

Economic Output: The economic output of an industry is generally represented by the total value of goods sold. For example, the economic output of the commercial fish processing sector is typically the wholesale value of the processed product produced. This includes all of the expenditures made to produce the product, including all of the fish purchased from vessels (i.e. the ex-vessel value of the harvest), as well as expenditures for energy and processing labor, packing materials, and other costs of goods sold. Economic output includes returns to owners in excess of variable costs.

I-O model (or Input-Output model): A mathematical representation of linkages between industries, households and other institutions in an economy. I-O models are typically used to estimate industry economic contributions or economic impacts of defined scenarios using calculated multiplier effects.

Indirect Effects: These are the expenditures, employment levels and activities of firms that supply inputs to the industry in question. Expenditures on nylon cord used to make pens in the aquaculture industry and nets in the commercial fishing industry are examples of indirect expenditures.

Induced Effects: These are the additional expenditures, employment and activities of firms that supply goods and services to employees and owners of the firms involved in the direct and indirect activities. Induced expenditures include expenditures at movie theaters and restaurants by employees of fishing vessels, fish processing plants, and firms that manufacture, distribute and sell nylon cordage.

Leakage: Funds that leave the regional spending stream to pay for goods, services and labor that are “imported” from outside the region. Indirect and induced spending rounds are limited due to the leakage of funds from the regional spending stream to pay for goods and services that may not be available locally.

Regional I-O model: An I-O model constructed to capture economic linkages and identify leakages in a defined local economy. Regional I-O models are used to measure economic contributions or impacts accruing in a specific place.

Regional Input-Output Analysis

Source: Northern Economics, Inc. *The Economic Impact of Shellfish Aquaculture in Washington, Oregon and California* http://www.pacshell.org/pdf/Economic_Impact_of_Shellfish_Aquaculture_2013.pdf

Task 4 - Washington Coast Commercial Fisheries (Non-Tribal and Tribal Components)

Non-Tribal Commercial Fishing

Commercial fishing is an important and historical component of the Coastal Washington economy. Landings and processing by commercial fisheries supply markets in the U.S., Canada and overseas and provide income and employment in harvesting, processing and support industry sectors in the region and elsewhere in the state. Important commercial fisheries operating on the Washington coast include those for groundfish (including sablefish, and both shorebased and at-sea fisheries for Pacific whiting), Dungeness crab, Pacific sardines, pink shrimp, albacore tuna, Pacific salmon (mostly Chinook and coho), Pacific halibut and shellfish such as razor clams. Published data sources such as PacFIN (for shorebased fisheries) and Norpac (for at-sea Pacific whiting) provide some idea of the scale of landings and exvessel revenue in these fisheries, but publicly available data underestimate activity for certain species and ports

due to confidentiality constraints which limit the ability to disclose business information for fisheries aggregations with fewer than three participating harvesters or buyers/processors. Consequently more detailed, vessel-level landings and ex-vessel revenue data, including activity in at-sea Pacific whiting fisheries operating off the Washington Coast, are required in order to adequately analyze contributions from all components of commercial fisheries operated off the Washington Coast.

Tribal Commercial Fisheries

Tribal fisheries make significant contributions to regional economic activity on the northern Washington coast. These fisheries operate on a commercial scale for several species including groundfish, Pacific halibut, Dungeness crab and Pacific salmon (mostly Chinook and coho). Tribal groundfish fisheries are allocated 10% of the U.S. annual catch limit for sablefish north of 36° North latitude, and at least 17.5% of the U.S total allowable catch for Pacific whiting. Tribal fisheries also manage substantial annual allocations of Pacific cod, lingcod and yellowtail rockfish; and a fishery for razor clams along the central coast. Catch from Washington Coast tribal fisheries is landed at Neah Bay, La Push, Westport and other Washington Coast ports. While some catch from tribal fisheries is processed outside the coastal region, e.g., in places such as Port Angeles, some is processed locally. For example, the Quinault Pride seafood plant in Taholah processes salmon, crab, halibut, razor clams and other species caught in tribal fisheries. In addition to a shore-based fishery component, in which vessels participating in the tribal Pacific whiting fishery deliver to processors in Westport, there is also an at-sea component consisting of several tribal catcher vessels that deliver to floating processor vessels that operate as motherships for this fishery.

Vessel-level data may not be recorded for tribal fisheries since vessels need not be registered with state or federal authorities. The data may also exclude ex-vessel revenue estimates associated with the landings. At a minimum it would be necessary to obtain tribal fisheries landings data at the buyer level, including activity in tribal at-sea Pacific whiting fisheries, in order to adequately analyze contributions from all components of Washington Coast tribal fisheries.

Available Fisheries Data

The PacFIN fisheries database is a comprehensive repository of landings and exvessel revenue data for vessels and fish buyers operating in commercial fisheries on the Pacific coast (including Washington inland waters and the Columbia River). PacFIN also includes data for landings made to Washington state-licensed fish buyers from distant ocean areas and from commercial-scale tribal fisheries conducted on the coast and in the Columbia River.

The Northwest Indian Fisheries Commission maintains a comprehensive database of landings made and in tribal fisheries. Data on Pacific whiting catch by catcher-processor vessels and deliveries to mothership floating processors participating in the at-sea Pacific whiting fishery, including deliveries made in the at-sea tribal fishery, are maintained in the Norpac fishery observer database.

While direct data on the ex-processor (or “first wholesale”) sales of fisheries products in Washington are not generally available, these values can be estimated from landings and revenue data and information from industry key informants using some fairly standard assumptions about the value of inputs used in seafood processing.

Information on the quantity and value of seafood products exported from U.S. customs district is available from NMFS (<http://www.st.nmfs.noaa.gov/commercial-fisheries/foreign-trade/applications/trade-by-specific-us-customs-district>).

In addition to reviewing existing officially-collected data, extant literature on relevant economic activities and reports produced by earlier-phase project contractors, government regulators, industry sources and other experts will be canvassed to gather additional information and identify emerging trends. For example, any available data from the National Marine Fisheries Service's IOPAC fisheries economic analysis models and Economic Data Collection reports for participants in West Coast groundfish trawl individual quota fisheries will be consulted to glean relevant information.

Data Confidentiality

Commercial fishing annual vessel summary data for recent years (2004-2013) for vessels landing in ports in Clallam, Jefferson, Grays Harbor, Pacific and Wahkiakum counties will be needed in order to analyze economic contributions and impacts of commercial fisheries at the port level. Variables needed include: year, area of catch, PacFIN port code, state port code, gear, species, vessel ID (or proxy), processor ID (or proxy), round weight, landed weight and ex-vessel revenue. Unfortunately publicly-available data reporting is heavily constrained by confidentiality concerns due to the limited number of participants in certain ports. Therefore it is necessary to obtain clearance to view confidential data. (Data that has been "anonymized" to obscure the identities of certain participants would likely not conceal the identities of major processors.)

Primary Data Collection

There is insufficient time between the completion of project scoping and June 2015 to enable design and implementation of statistical surveys to obtain industry expenditure patterns from fisheries participants. In any case it is also not clear that statistically valid data on Washington Coast fisheries participants could be collected using a voluntary survey of this type. Instead it is recommended that a key-informant approach to industry data collection be used to collect primary data on tribal and non-tribal fisheries harvesting, processing and distribution activities. Data collected from key informants will be used to supplement data obtained from published sources in order to calibrate the economic contributions and impacts of fisheries-related activities.

Key informant contacts will include government agency personnel at Washington Department of Fish and Wildlife, experts at regional universities and Sea Grant, and representatives of industry groups including commercial fishermen's and processors' associations, tribal fisheries representatives, and other regional industry support and advocacy groups. Experience has shown that often the best way to collect data from fisheries participants is to use industry focus groups and to request economic data in terms of percentages of total expenditures rather than as actual dollar amounts. Information on average percentages or shares spent in key expenditure categories by fisheries harvesters and processors combined with official data on landings and first wholesale revenues can be adapted for incorporation in analytical models.

Key informant interviews may also be used to collect information on participation by Washington Coast residents in commercial fisheries conducted elsewhere on the West Coast or in Alaska. There has long been a history of cross-participation in Alaska by West Coast fisheries participants; and due to diminishing

opportunities and high entry costs in IFQ fisheries it has reportedly become increasingly necessary to supplement West Coast fishery income with earnings and experience gained from participation in Alaska fisheries. Since Alaska fisheries have their own very strict confidentiality rules there is probably no way to collect this type of information other than through personal interviews.

Analytical Approaches for Analyzing Commercial Fisheries Impacts

At the scoping workshop we identified three alternative “levels” or approaches to the economic analysis. The Level I approach relies on existing data and publications and envisions little by way of incorporation of other secondary data and no primary data collection. While the Level II approach includes construction of economic impact models using a software package such as IMPLAN and some validation of underlying data in the models using existing data sources, it also envisions little or no primary data collection activities. The Level III analytical effort includes all components of Levels I and II plus the incorporation of economic data collected from focus groups or other interviews with local experts and key industry informants.

Much of the effort in building, verifying and modifying regional economic models will involve calibrating components for the commercial fisheries, tribal fisheries, recreational fisheries and aquaculture sectors; although the same models will also be used to estimate economic contributions and impacts of alternative use scenarios involving Shipping, Renewable Energy and other affected industry sectors.

Task 5 – Profile of Shellfish Aquaculture

In 2011-2013, Northern Economics Inc. (NEI) and the Pacific Shellfish Institute (PSI) developed an I-O model of the shellfish aquaculture industry in Washington, Oregon and California using 2010 data. This study was conducted to offset one of the major limitations of the standard IMPLAN models. For this project we propose to revisit the data obtained and developed in the NEI/PSI study with a focus on oyster aquaculture on the Washington Coast. Using a focus group format, we will then provide data on the numbers of acres in production, revenue, employment, expenditures, and economic impact estimates to representatives of the coastal Washington shellfish aquaculture industry for review. We anticipate that the local growers will be able to suggest appropriate changes to the estimates so that they more realistically represent the industry in the relevant two counties of Grays Harbor and Pacific. We will also discuss official QCEW estimates of employment in coastal the shellfish aquaculture with key informants to determine if “official” estimates are materially inaccurate.

In addition, to this initial review, we will conduct up to 10 key informant interviews with members of the oyster processing and distribution sectors to collect relevant data on their production levels, sales, revenues and expenditures. This data will be used to enhance the existing NEI/PSI shellfish aquaculture Input / Output model by accounting for the impact of these subsidiary producers in the aquaculture industry of Pacific and Grays Harbor counties. Enhanced model results will provide estimates of direct, indirect, and induced economic impacts, employment, and relevant multipliers associated with the Washington Coast oyster aquaculture industry.

Task 6 - Ecosystem Services

A number of studies have attempted to estimate the value of ecosystem services in watersheds, small regions, or even particular land parcels. These studies have utilized a wide variety of site-specific physical

and biological data to derive estimates. Such information is not generally available in uniform measure or degree of detail at the full scale that can be applicable to all counties.

The Level II analysis will include research on valuations from representative locations, and the identification of sites in the planning area that are likely to carry relatively high ecosystem service values. The Economics Team intends to carry out the Level II approach.

Task 7 - Recreational Fishing

The key analytical objectives for the recreation fishing economic assessment are to construct an economic baseline that characterizes existing recreation fishing levels and associated angler spending in the coastal study area, and to develop impact mechanisms to assess the effects of future uses in the coastal study area that could affect recreation fishing activities. Because of data and schedule limitations, the analysis will rely on existing information only.

The primary goal of the proposed economic analysis of marine recreational fishing is to develop a comprehensive accounting of this activity by region along the Washington Coast that allows for assessing potential local and regional economic impacts of current and potential uses of coastal resources. We intend to develop fishing-related expenditure profiles, and important economic impact mechanisms (e.g., angler catch per unit of effort) for assessing effects of potential changes in coastal uses, to the extent that information is available.

The characterization of marine fishing activities will involve the following tasks:

- Research and develop profiles of recreational fishing activity by species group, ports/marinas of fishing activity, and mode of fishing (shore, charter-boat, and private boat).
- Research and develop profiles of trip-related expenditures and expenditures on durable goods used for marine recreation fishing.

The main data to be used for estimating economic impacts associated with recreational angling are the location, number and type of trips (charter or private) and average local expenditures by trip type. This important task will be challenging given the uncertainty of how proposed future uses may affect species population and recreational fisheries, and therefore may be more qualitative.

Task 8 - Recreation and Tourism

The key analytical objectives for the recreation and tourism assessment are to construct an economic baseline that characterizes existing recreation and tourism in the coastal study area, and to develop impact mechanisms to assess the effects of future uses in the coastal study area that could affect recreation and tourism activities. Additionally, the assessment would establish the relative importance of the recreation and tourism industry at the sub-county, community level along the coast. Because of data and schedule limitations, the analysis will necessarily involve two phases of effort, with the second phase providing additional informational detail, particularly at the sub-county level. This scope of work, however, focuses on the first phase of the analysis, which is scheduled for completion by June 2015.

To characterize the contribution of recreation and tourism to the overall coastal economy and to assess the effects on the recreation and tourism industry of the five scenarios involving future uses of

Washington's coastal economy, a baseline must be developed that provides adequate detail concerning recreation and tourism activities, activity levels, and associated expenditures.

Of particular importance to the modeling of economic effects will be developing information on the proportion of overall recreation and tourism activity that is attributable to residents and non-residents of the four coastal counties. While the spending of non-residents generates new economic activity within each county, the spending of residents generally does not, as it represents a shift of spending from one good or service to another within the county economy. Percentages of resident versus non-resident spending will be developed based on information collected as part of the Surfrider Foundation study and from other published sources (e.g., intercept survey information). (Note that the Surfrider Foundation survey is collecting data from Washington residents only.)

Task 9 - Coastal Washington Social and Cultural Profiles

This task will be coordinated with Tasks 1 and 2 (Economic Profiles of the Coastal and Tribal Economies), and will also involve coordination with efforts by Sea Grant to establish social indicators.

The primary data sources for all of the economic/demographic profiles will be the American Community Survey (ACS) developed by the US Bureau of the Census, US Bureau of Labor Statistics (BLS) for employment and compensation data, and the US Bureau of Economic Analysis (BEA) Regional Economic Information System. These data sources will be augmented by up to 20 interviews with community leaders with extensive knowledge of the social and cultural dimensions of their community.

At a minimum the social and cultural profiles will include basic information listed in the NMFS Guidelines and Principals for Social Impacts Analysis including:

- Population characteristics (e.g. employment, income, demographics)
- Community and institutional structures (e.g. housing, support systems)
- Political and social resources
- Individual and family changes
- Community resources

Task 10 - Risk and Industry Vulnerability Analysis

Several WCMAC members indicated strong interest in a "risk analysis" applied to commercial fishing and aquaculture. We believe that an assessment of the vulnerability of each commercial fishing, recreational fishing, tribal fishing, and aquaculture industries on the coast to "catastrophic events" is worthwhile. Examples might include events leading to a closure of a fishing area or prohibition on harvest of certain species, or a temporary (season-long) or multi-year loss of an aquaculture farming area. The goal of the assessment would be to determine how the industry would cope with such losses, and the extent to which the industry and its support infrastructure may be able to bridge a loss period.

Two components would be included in this effort. The first would be to interview key informants in each industry to find out what actions they might take if faced with certain closures; they may include temporary or permanent shifts to other target species, or other locations, if available to them. The second effort would be to research and identify sources of financial relief at both the state and federal level, including rules and restrictions associated with those options.

This information would be used to develop a qualitative assessment of the relative vulnerability of the industry, and would be reported in a section of the main report. Measures of vulnerability will be consistent with those available in the literature, including the relative resiliency of the industry to withstand short-term losses.

Task 11 – Scenarios Development

The Technical Committee has identified a number of potential scenarios to examine, and the team anticipates that more may be generated by the completion date of this project. The economic analysis tools will be set up to accommodate examination of alternative proposals and scenarios. The Economics Team will work with the Agencies to define particular assumptions associated with each scenario, and will prepare a qualitative analysis table evaluating the effect of the scenario on the components as “positive,” “negative,” or “neutral.”

Task 12 – Coordination with WCMAC and Agencies

Dr. Taylor will provide monthly updates via conference call with the DNR Project Manager and Ecology on the progress of the project tasks, including discussion of accomplishments, status, and barriers. In addition, at one (1) or two (2) points in the process, Dr. Taylor will participate in a conference call with the Technical Committee of WCMAC to update them on the status of the project.

Task 13 – Presentations to the Agencies and WCMAC

The Economics Team will make two presentations to the WCMAC and Agencies. The first will be following the completion of the draft report, or approximately mid-April 2015. The second presentation will take place following completion of the final report, or prior to June 2015.