REVIEW OF THE 2009 NATIONAL MARINE FISHERIES SERVICE'S SOUTHERN OREGON/ NORTHERN CALIFORNIA COAST COHO SALMON DRAFT RECOVERY PLAN

Prepared for the Center of Independent Experts

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1. Executive Summary

This review evaluates and comments on the draft Southern Oregon/Northern California Coast (SONCC) Coho Salmon Evolutionary Significant Unit Recovery Plan. The aim of the recovery plan is to establish criteria for delisting the ESU and to present recovery actions necessary to reduce stresses and threats to ESU recovery. As such, the review focuses upon: (1) the use of the best available scientific, technical and commercial data and information; (2) interpretation and application of the National Marine Fisheries Services' Southwest Fisheries Science Center SONCC Technical Recovery Team's supporting technical recovery planning reports; and (3) determination on whether processes developed for and methods employed provide adequate linkages between the SONCC TRT population and ESU recovery criteria, coho salmon life stage specific biological stresses inferred from physical habitat-based threats assessment, and the recovery actions and strategies developed to reduce or abate those population threats.

The recovery plan provides a clearly articulated and biologically meaningful conceptual framework based on coho salmon populations as the fundamental unit of recovery. It is effective in identifying the importance of physical and ecological processes that generate the habitat conditions for each life stage. Key aspects of the species biology, life history and threats that are pertinent to the ESU's endangerment and recovery are thus identified. The information, organization and emphasis given to each of the six life history episodes that form the framework of the life stage approach used, however, is somewhat unbalanced. Despite this, the stresses and threats pertinent to the ESU's endangerment and recovery are effectively delineated. The recovery plan does provide useful and meaningful targets for recovery, identifying the importance of core populations and non-core independent populations, of sufficient habitat availability across the ESU, of connectivity among populations, and of abatement of stresses and threats. With regards to meeting the minimum standards described in section 4(f)(1)(B) of the ESA, the plan is effective in doing so for two objectives, but is incomplete for the third, which addresses the need for estimates of the time required and costs to carry out measures to achieve the plan's goal.

Products developed through SONCC Technical Recovery Team Reports are used to establish historical ESU structure, including diversity strata and core populations, and to establish population viability criteria used in the recovery plan. Some of the viability criteria used, however, would benefit from more detailed justification and/or scientific foundation, such as the thresholds for watershed size, hatchery straying and depensation. The recovery plan does provide a clear distinction between biological population viability and threats abatement recovery criteria. However, it also appropriately recognizes that stress and threat abatement should improve habitat and ecosystem processes throughout the ESU, thus increasing the productivity of the populations and improving ESU viability.

The recovery plan explicitly identifies measurable stresses and threats. However, derivation of some of the stress and threat criteria thresholds would benefit from a more explicit foundation in scientific knowledge. It is recognized that not all criteria will be measurable in a quantitative sense and thus qualitative criteria based on professional judgement are included. Greater detail, however, is needed by which to evaluate the appropriateness of the use of professional judgement in the stress and threat rankings. Also, more explicit recognition of the uncertainties

that surround the measurement and application of the criteria would be appropriate. Despite these minor shortcomings, Conservation Action Planning (CAP) methodology was particularly effective in assessing stresses and threats, providing a platform for identifying and organizing the best available information and professional judgement across the 45 populations assessed. The population profiles provide a basis for summarizing information on each population, conveying what is needed to recover/reduce the threats affecting the population. They also help with the logical framework needed for prioritizing recovery efforts at multiple spatial scales and thus increasing the likelihood of achieving measurable results.

Adaptive management will need to be central to the recovery process. It will allow evaluation of the effectiveness of recovery measures and for mid-course corrections in recovery actions. Recovery of the SONCC coho salmon ESU is a significant challenge, and the development of this recovery plan provides a critical framework within which the likelihood of recovery may be effectively achieved.

2. Introduction

a) Background – In accordance with the statement of work (see Appendix 2) and terms of reference, the purpose of this independent review is to evaluate and comment on the draft Southern Oregon/Northern California Coast (SONCC) Coho Salmon Evolutionary Significant Unit Recovery Plan. As requested, the review focuses on three aspects of the draft recovery plan document. (1) The use of the best available scientific, technical and commercial data and information. (2) Interpretation and application of the National Marine Fisheries Services' Southwest Fisheries Science Center SONCC Technical Recovery Team's (TRT's) supporting technical recovery planning reports. (3) Determination on whether processes developed for and methods employed provide adequate linkages between the SONCC TRT population and ESU recovery criteria, coho salmon life stage specific biological stresses inferred from physical habitat-based threats assessment, and the recovery actions and strategies developed to reduce or abate those population threats. The review does no evaluate or comment upon the TRT documents or the Threats Assessment template.

The Southern Oregon/Northern California Coast (SONCC) coho salmon evolutionary significant unit (ESU) includes all populations of coho salmon in coastal watersheds from the Elk River near Cape Blanco, Oregon, in the north through and including the Mattole River near Punta Gorda, California, in the south. The ESU was delineated based on being substantially reproductively isolated from other coho salmon populations, and having been determined to represent an important component in the evolutionary legacy of the species (described in Weitkamp et al. 2005). Environmental characteristics appear important in designating the northern boundary of the ESU, with strong and consistent coastal upwelling beginning around Cape Blanco and continuing south into central California. This results in a relatively productive nearshore marine environment, with coho salmon from this region being captured primarily in California waters whereas those to the north of Cape Blanco are most frequently captured off the Oregon coast. Furthermore, genetic data indicate that southern Oregon coho populations differ, on the whole, from those to the north of Cape Blanco. The southern boundary of the ESU is similarly marked by a strong environmental transition at Punta Gorda and substantial genetic

differentiation, in general, from coho salmon populations to the south. Within the ESU, 45 separate populations have been identified and organized into seven different diversity strata (Williams et al. 2006).

In a 1995 review of the status of coho salmon from Washington to California, the populations of the SONCC ESU were identified as depressed relative to past abundance, with some being heavily influenced by hatcheries (Weitkamp et al. 1995). Then, on 6 May 1997 the coho salmon evolutionary significant unit was listed as threatened (62 FR 24588), including all hatchery coho salmon (28 June 2005, 70 FR 37160). Two years later, the critical habitat for SONCC coho salmon was designated (5 May 1999, 64 FR 24049). The decision to list the ESU was largely based on run sizes (severe declines based on historical records) and human-caused factors, including degraded habitat and associated reduction in carry capacity, harvest, and artificial propagation, that exacerbate adverse effects of natural environmental variability brought about by drought, floods and poor ocean conditions. In response to the listing, the Endangered Species Act required the National Marine Fisheries Service (NMFS) to develop and implement a recovery plan for the conservation of the SONCC coho salmon ESU. The aim of the recovery plan, consistent with the ESA recovery planning guidance (NMFS 2007), is to establish criteria for delisting the SONCC coho salmon and present recovery actions necessary to reduce stresses and threats for 'species' recovery. As such, it focuses on coho salmon populations as the fundamental unit for recovery, as well as the physical and ecological processes that form the habitat conditions necessary for fulfilling life stage needs.

The charge for the present review was to evaluate and comment on the draft Recovery Plan for the ESU of SONCC coho salmon. The review was undertaken in accordance with the Statement of Work and Terms of Reference. My area of expertise in relation to the present review is the evolutionary ecology of fishes, particularly that of salmonid fishes. In section 3 of this report, I thus address each of the questions presented under the terms of reference on the basis of this expertise.

b) Description of Review Activities – Access to a series of background documents was made available at an FTP site on 21 May 2009 and reading of these documents began. Components of the NRC 2004 Klamath River report were added subsequently to the FTP site. The review was to commence on 15 June 2009, with the receipt of the draft recovery plan document. However, the document was not received until 19 June and thus the review was delayed slightly until 3 July. All documents provided were studied and the draft recovery plan thoroughly examined.

In undertaking the review, I focused on the questions presented under the terms of reference, applying my expertise in fish evolutionary ecology to evaluate and comment on the 2009 draft Recovery Plan for the ESU of SONCC coho salmon. While I have some familiarity with the region under consideration, I am not in a position to provide detailed site-specific comments regarding the recovery plan for the SONCC coho salmon ESU.

3. Summary of Findings in Accordance with Terms of Reference

In undertaking the review, I focused on the questions presented under the terms of reference and addressed each in turn below. The questions are arranged under the six categories in which they were originally presented.

Fundamental Questions for the CIE Reviewers

1. *Does the recovery plan delineate those aspects of the species biology, life history, and threats that are pertinent to its endangerment and recovery?*

The recovery plan does delineate key aspects of the species biology and life history, dividing them into six life history episodes. The organization and emphasis given to each of these life history episodes, however, is somewhat unbalanced and may not reflect their true importance. The section on estuaries (3.1.3) is comprehensive and provides an excellent overview of their potential importance to SONCC coho salmon (4 of the 12 pages devoted to coho life history). By contrast, other life history episodes are addressed rather superficially, despite constituting considerably longer periods of the life history. I am not suggesting that the section on estuaries decrease in size, but rather that the other sections be increased accordingly to become more comprehensive.

Some of the descriptions of the biology and life history of coho salmon did not appear to make use of the best available scientific information, and inconsistencies in the information reported existed among different sections of the chapter (e.g. regarding smolt size). With regards to spawning and incubation, it is implied that "redds" are equivalent to "gravel nests", which is incorrect. Female salmon spawn their eggs in nests over the course of several days (coho: 1-5 nests over 2-4 days; Godfrey 1965, van den Berghe and Gross 1984, Fleming and Gross 1992, 1993), with several hours between each spawning event, during which the female covers her previous nest and prepares a new nest for the next oviposition event. The contiguous area of disturbed gravel containing the nest(s) is referred to as a 'redd' (*sensu* White 1942, Crisp and Carling 1989, Fleming 1998) and females may create more than a single redd, each of which may contain one or more nests. However, the majority of female Pacific salmon create their nests within a single redd, easing female nest defense. It is also inaccurate to suggest that "once spawning is complete the female will cover the redd with gravel." Rather females cover each nest immediately after oviposition and do not wait until spawning is complete to cover the series of nests. An important point that might be added to this section is that coho salmon differ from most other Pacific salmon (sockeye, pink, chum and Chinook to a lesser extent) in that spawning within a population is often protracted (averaging 58 ± 20 d, $N = 7$ populations, cited in Fleming and Gross 1994) and may extend over more than 11 weeks (Fleming and Gross 1990). From a management/recovery perspective this will be important in terms of maintaining or improving hydrologic conditions for spawning and egg incubation.

It is also worth noting that embryo survivorship to emergence is dependent on female choice of spawning location (pg 3-1, 3 paragraph), which influences the riverbed conditions the eggs are likely to experience during incubation. Changes in hydrology and environmental characteristics (e.g. due to human habitat modifications, climate change) may lead to a disconnect between

conditions females use for identifying appropriate nest sites and that that is appropriate for incubation and emergence. It is somewhat surprising that incubation is referred to as the period of where the majority of salmon mortality takes place, with average survival during incubation considered to be 15-27%. Reports for other coho populations (Shapovalov and 1954, Briggs 1953, Koski 1966 [cited in draft recovery plan]) and other Pacific salmon species (Quinn 2005) suggest higher rates. Care should be taken to ensure that survivorship during incubation is not confounded by measures of survivorship at emergence from the gravel, when fry begin relying on exogenous food sources for the first time and are exposed to a new sweet of predatory threats. Indications from other salmonid species suggest mortality at emergence is significant and may override that at other stages in early life (e.g. Elliot 1994, Einum and Fleming 2000a). It may be better to refer to the survival estimates that are presented as being "egg-to-fry" rather than "incubation." Also, it should be noted that egg-to-fry survival rates may be higher than fry-to-smolt and smolt-to-adult for coho salmon (e.g. see Quinn 2005). In fact, pg 3-3 of the draft report states that "most mortality takes place in the first summer and fry-to-smolt survival rates average between 1.27% and 1.71%.," which contradicts the statement in section 3.1.1 that the incubation is the period of the majority of mortality. Furthermore, while the document refers to the timing of reproduction as a critical adaptation, it should be made clear that this is because of its direct influence on the timing of fry emergence from the gravel (a critical period of mortality; e.g. Einum and Fleming 2000b).

The section on rearing and outmigration (3.1.2) is rather superficial, with only about half of the little more than 2 pages devoted to freshwater rearing, despite this life stage constituting typically a third of the life history and being a period of exposure to a number of stressors and threats. Equal attention is given to smolt migration and estuarine rearing, despite the juvenile rearing in freshwater being the dominant life history activity during this period. The material on smolt migration and estuarine rearing would be better placed in the section on estuaries (3.1.3), where outmigration and estuarine rearing are already discussed. The current situation results in redundancies and overlaps in the material presented in the two sections, as well as inconsistencies. For example, data for the timing of smolt migration and the size of smolts differ noticeably from page 3-3, lines 19-22 to page 3-4, lines 16-26 to page 3-6, lines 3-5.

Similar to section 3.1.2, the section on ocean migration (3.1.3) seems somewhat superficial and outdated, particularly in relation to feeding patterns, their influence on body size and survival, and changes in ocean conditions. There is considerable recent information which could be summarized here. This is particularly relevant given the effects of apparent climate change on run sizes, as well as fish sizes (as discussed under maturation). With regards to trends in coho survival and maturation, more recent papers, for example, by Koslow et al. (2002), Logerwell et al. (2003), Lawson et al. (2004) and Koseki and Fleming (2006, 2007) would provide the reader with additional insight into the effects of ocean conditions on spatial and temporal synchrony in survival and male maturation (i.e. as two- [jack] versus three-year-old [hooknose] males) for coho populations close to, or within the SONCC ESU.

Unlike the sections on coho biology and life history, the draft recovery plan is effective in delineating those aspects of threats that are pertinent to the SONCC coho salmon ESU's endangerment and recovery. It provides both a description of the reasons for the original listing and an update on the current impacts of these threats, as well as information on additional threats

that were not identified in the listing document but are likely to be important in recovery (section 2.2). The list of threats appears comprehensive and their explanation concise and informative. There were a few points of confusion, however. In the section on overutilization (2.2.2), the opening paragraph refers to current harvest rates being low and with the commercial fleet harvesting ca. 40% of returning adult coho since the early 1990s. Yet, in the following paragraph (pg 2-8), the document refers to all ocean commercial fisheries being prohibited in 1993 and coho retention in ocean recreational fisheries prohibited the following year. The opening paragraph of this section thus leads to some confusion. With regards to the section on inadequacy of existing regulatory mechanisms, coordination among different agencies strikes me as a potential problem; however, this is not addressed as a concern. There appear to be numerous regulations, almost mind boggling, without a formal body to help coordinate these. The section on threats (2.2) is long and would benefit from a summary at the end that would provide an overview and synthesis of the major threats.

2. *Is the recovery plan grounded in a clearly articulated and biologically meaningful conceptual framework?*

The recovery plan does provide a clearly articulated and biologically meaningful conceptual framework based on coho salmon populations being the fundamental unit of recovery. The approach follows logically from two Technical Recovery Team reports, one on the structure of the SONCC coho salmon ESU (Williams et al. 2006) and the other on a framework for assessing the ESU's viability (Williams et al. 2008). Understanding the biological organization of populations, on both spatial and temporal scales, that make up an evolutionary significant unit has to be central to any plan for recovery. The conceptual framework is also effective in identifying the importance of physical and ecological processes that generate the habitat conditions necessary for each life stage, and in doing so, aid in the identification and potential remediation of stressors and threats. Population viability will depend on fish surviving and developing into subsequent life stages to complete the life history. Any bottleneck will likely impede population productivity, unless there is compensation at subsequent life stages (e.g. in response to reductions in density-dependent processes). Thus, the life stage approach provides tractable means of identifying bottlenecks (stressors and threats), as well as modeling population dynamics.

3. *Does the recovery plan provide a useful and meaningful "road map" to recovery and have a logical strategy to achieve recovery that is relevant to habitats, life stages, populations, diversity groups and the overall ESU?*

The recovery plan does provide useful and meaningful targets for recovery, identifying the importance of core populations and non-core independent populations, of sufficient habitat availability across the ESU, of connectivity among populations, and of abatement of stresses and threats. While there is no explicit "road map" to recovery presented, there is a hierarchical structure by which recovery would be achieved based on the configuration of populations within diversity units within the ESU. The recovery plan has taken the logical strategy of implementing a set of rules that are likely to result in a viable ESU. These rules derive from the work of Williams et al. (2008) and aim to maintain diversity throughout the ESU, provide connectivity among populations to maintain long-term demographic and genetic processes, and provide a

buffer against potential catastrophic risks. In doing so, a set of demographic objectives and criteria were established, as were a set of stresses and threats abatement objectives and criteria. This process seems reasonable in light of the data deficiencies that exist and are likely to persist for some time into the future. This means that while determining recovery that is relevant to habitats, life stages and populations may be difficult to undertake across all of the ESU (data, time and money limitations), directed achievements at the population scale will be important in easing the determination of recovery at the larger scale of diversity groups and the overall ESU.

4. *Does the plan use and incorporate the best available scientific, technical and commercial data and information?*

Certain sections of the recovery plan (e.g. section 3) would be benefit from updating, as discussed previously in question 1 above. To my knowledge, other sections use and have incorporated the best available scientific, technical and commercial data and information. Note, however, that many of the articles cited in the plan were not contained in the reference list (section 10) making it difficult to assess the quality of the work referred to. There are places where it is not clear how critical limits are derived. For example, small watersheds (e.g. < 4 km of stream) are considered unlikely to have historically supported viable populations. The foundation for this should be clarified. There is implicit discussion of this in Williams et al. (2006, 2008), but the focus is more on population size. Yes, small populations are more likely to have gone or will go extinct, but the size of the population need not directly reflect the size of watershed. Small streams/watersheds are often more productive per area than large rivers/watersheds. Similarly, the 5% rule for hatchery straying seems somewhat arbitrary (see Williams et al. 2008) and a better foundation in knowledge of the likelihood of "effective" straying, as well as natural levels of straying (and population genetic theory) could be used to substantiate this rule. By contrast, the determination of intrinsic potential (IP) appears reasonable and the GIS model that includes a critical temperature maximum (well founded on scientific knowledge) allows for quantitative assessment. It would be helpful, however, to cite Williams et al. (2006) in connection with the 34 IP km threshold (pg 3-14), which otherwise appears without support in the recovery plan. The derivation of the depensation threshold references Williams et al. (2008), however, the document provides little biological foundation for its use in regards to salmon. To my knowledge, there is little evidence of depensation in salmon because of the keen ability of males to search out female mates (this may in part explain why salmon are good colonizers). Thus, the depensation thresholds presented appear somewhat arbitrary and their usefulness may be questioned.

5. *Does the plan meet the minimum standards described in section 4(f)(1)(b) of ESA by including site-specific management actions, objective measurable criteria and estimates of time and cost?*

The draft recovery plan does meet the minimum standards described in Section 4(f)(1)(B) in terms of (i) site-specific management actions as may be necessary to achieve the plan's goal for the conservation and survival of the SONCC coho salmon ESU. For each of the 45 populations identified within the ESU (Williams et al. 2006) there is a profile that summarizes available information pertinent to coho salmon and the ecosystem processes within the watershed. These profiles are organized such as to provide guidance to restoration and recovery efforts, including

information on historic fish distribution and abundance, habitat and land use changes in the watershed, existing conservation activities, current extinction risk of the population, future land use and human population trends, physical and biological conditions in the watershed, and a recovery strategy for the population. The plan also provides (ii) objective, measurable criteria for both the determination of demographic viability, which requires all diversity strata to be viable (specific objectives and criteria based on population demographics are outlined therein), and the criteria for the abatement of stresses and threats. However, (iii) estimates of the time required and costs to carry out those measures to achieve the plan's goal were incomplete. The draft recovery plan explicitly recognized this. Meeting the demands of (iii) will require additional effort and will necessarily be imperfect because of lack information upon which to base such estimates. As noted, adaptive management should be central to the recovery plan.

6. *Does the plan incorporate general recovery tenants for coho salmon in the Klamath-Trinity River basin previously identified by the National Research Council in their final 2004 report?*

The draft recovery plan does appear to incorporate general recovery tenants for coho salmon in Klamath-Trinity River basin previously identified by the National Research Council (NRC 2004). This includes the need for significant changes to the hydrologic function of Klamath-Trinity River basin, such as removal or provision of effective passage at dams and water diversions, purchase/lease of water rights and improved riparian habitat to re-establish cool summer flows (e.g. in the Shasta and Scott Rivers), treatment of severe sites of sediment delivery associated with roads, timber management and grazing and prescription of land-use practices, and changes to hatchery operations, including possible closures, to reduce detrimental impacts on wild populations. The NRC report does make recommendations about monitoring and the collection of scientific data for the Klamath-Trinity River basin. These are not incorporated explicitly in the draft recovery plan; however, there is the implicit recognition of the need for such things. As noted in the letter to reviewers from the NMFS Southwest Region Arcata Area Office, the section on monitoring and adaptive management in the draft recovery plan is incomplete. It would appropriate that recommendations from the NRC (2004) report be considered for incorporation as this section is further developed.

7. *Is the plan suitable for serving as an outreach tool to co-managers, stakeholders and other interested individuals or organizations and does it invite public participation in the recovery process?*

Generally, the plan is suitable as an outreach tool. It provides both general information, as well as specifics for each of the 45 populations identified in the ESU. There are places, however, where the document relies heavily on information contained in separate TRT reports (e.g. Williams et al. 2006, 2008) and this requires the reader to access these reports to understand the derivation of certain processes and criteria thresholds. It is a well organized and relatively succinct document (compared to other such documents I have reviewed) that should invite public participation in the recovery process. Readers can easily navigate the document to find the material they are interested in.

Questions Regarding Use and Application of the SONCC Technical Recovery Team Reports

8. *Are the products developed by the SONCC TRT from the SONCC Historical Population Structure and SONCC Population Viability Criteria reports described and applied appropriately within the recovery plan?*

The products developed by Williams et al. (2006) and Williams et al. (2008) were central to the delineation of the ESU structure, including diversity strata and populations, and to establishing population viability criteria used in the recovery plan. On the whole, these products were described and applied appropriately within the recovery plan. However, as discussed in the answers to questions 4 and 7, there were criteria where the description and/or scientific support could be improved (e.g. watershed size, hatchery straying and depensation thresholds). Some further attention to this would be appropriate.

9. *Is the SONCC recovery plan clear regarding the differences between biological population viability and threats abatement recovery criteria?*

The recovery plan does make a clear distinction between the biological population viability and threats abatement recovery criteria. Chapter 6 of the recovery plan lays this out, making it easily accessible and understandable to the reader. While the biological population viability criteria assess components of population demography, the stresses and threats abatement criteria address the habitat and ecosystem processes that support the SONCC coho salmon ESU. It also identifies the relationship between the two sets of objectives that result from the habitat-based strategy proposed. Addressing the stress and threat abatement objectives should improve habitat and ecosystem processes throughout the ESU, thus increasing the productivity of the populations, particularly those core to the ESU, improving the ESU's viability. As noted in the recovery plan, this strategy assumes that populations will be able to respond largely on their own to habitat improvement and that this is the most effective way to recovery. Climate change does add a wrinkle to this and may be among the greatest hindrances to recovery. However, as rightly pointed out in the recovery plan, implementation of a habitat-based strategy is likely to maximize the capacity of populations to persist and adapt to climate change.

Questions Regarding Factors for Decline and New Threats Assessment Methodology

10. *Does the recovery plan provide an evaluation of threats discussed in terms of the five ESA listing factors identified under ESA section 4(a)(1) (e.g., the present or threatened destruction, modification, or curtailment of its habitat or range) at the time of listing?*

Yes, chapter 2 of the recovery plan provides an effective overview of the listing factors and their role in the decline of SONCC coho salmon at the time of listing. The threats are clearly presented and a subsection is devoted to each of the five ESA listing factors identified under ESA section 4(a)(1). As noted in the response to question 1 of this review, chapter 2 would benefit from a summary at the end to provide an overview and synthesis of the major threats.

11. Does the plan explicitly identify measurable threats and track, through objective measurable criteria, how each threat will be reduced or ameliorated, through specific management actions?

Chapter 4 of the recovery plan document provides an effective presentation of stress and threat ranking methods, relying on quantitative indicators where possible and qualitative assessments where little or no data are available. In cases where more than one indicator was available relating to a stress or threat, rankings were converted to numerical values and averaged to determine the stress or threat ranking for each life stage. However, I would have liked to see justification for taking the average (arithmetic mean) versus geometric mean, mode or median, or even going with the highest ranked indicator. An average rank may not truly reflect the degree of stress or threat the population is experiencing. It was good to note that where the available data were believed to produce an erroneous threat ranking, professional judgement was used to adjust the ranking. Unfortunately, the appendix (Appendix A) detailing how professional judgement was factored into the rankings was not contained in the draft recovery plan and thus could not be evaluated. The methods for ranking threats due to roads, agriculture, timber harvest and urban/residential/industrial development all relate to the area affected, but do not consider how differing practices alter the degree of impact per area affected (e.g. better management practices will decrease the degree of impact for an affected area). How this might be effectively incorporated should be considered (may be it is to some extent in terms of professional judgement) and/or clarified.

Section 6.2 of the recovery plan then provides objective measurable criteria for threat abatement following each of the five ESA listing factors described in section 4(a)(1) of the ESA. These are presented in a clear and an effective manner. Not all criteria will be measurable in a quantitative sense, and thus qualitative criteria, as presented in regards to some of the listing factors, are appropriate. However, this will make objective assessment more difficult. With regards to listing factor D (inadequacy of existing regulatory mechanisms), one criteria that might be considered is increased coordination among regulatory agencies. This should lead to more effective management, regulatory enforcement, and evaluation and modification of existing regulations. With regards to listing factor E (other natural or man-made factors) and climate change, prioritizing the mitigation of populations most at risk from future climate change should be reconsidered (pg 6-17, lines 33-34). Would it be better to prioritize populations most likely to persist and adapt to future climate change, given abatement of existing stresses and threats? Either way, justification for the approach to be taken should be provided.

Specific management actions for the diversity stratum are provided in section 7.3, with population-specific recovery actions provided in chapter 11. On the whole, these appear comprehensive and well organized. The Nature Conservancy's Conservation Action Planning (CAP) methodology (The Nature Conservancy 2005) provides an effective means for identifying measurable threats and for tracking recovery actions and their effectiveness. It also allows for consistency in recovery planning across populations. I do not, however, have the knowledge of the environments under consideration to fully evaluate their case-specific appropriateness.

12. *Is the modified Nature Conservancy's Conservation Action Planning (CAP) Threats Assessment protocol/methodology employed for assessing anadromous salmonid threats effective?*

Yes, it provides an effective means of identifying and organizing the best available information and professional judgment regarding stresses and threats. It also allows for the tracking of information in a consistent way for use in developing, implementing, tracking, and modifying recovery actions. Some of the questions below have been addressed in a more general sense in answers to previous questions (e.g. questions 5 and 8-11).

a. *Does the plan contain a fair assessment of current population and habitat conditions, and the identification of the biological stresses to coho salmon life stages and sources of stresses (i.e., threats)?*

The CAP methodology used in the recovery plan provides what appear to be fair assessment of current population and habitat conditions, and the identification of the biological stresses to coho life stages and sources of stresses and threats. However, as mentioned previously, I do not have the knowledge of the environments under consideration to fully evaluate their case-specific appropriateness.

b. *Is the threats assessment methodology developed objective and transparent for this species and have all realistic threats been identified?*

Yes, the threats assessment methodology does, on the whole, appear objective and transparent. However, it must be recognized that the use of "professional judgement" for some stress rankings may lead to subjectivity. It was not possible to assess how professional judgement is factored into rankings because Appendix A was absent from the recovery plan document provided. To my knowledge, all realistic threats that are likely to be of major significance have been identified.

c. *Are other limiting factors considered for each threat (e.g., its' scope, severity, frequency, magnitude, etc.) as suggested in the Recovery Guidance?*

The ranking of threats as instituted by the recovery plan does allow for the incorporation of other limiting factors (e.g. scope, severity, frequency and magnitude) to a large extent. For example, each population profile provides a table summarizing the severity of threats affecting each life stage.

d. *Do the scoring and rankings in the matrices link logically to your understanding of the species and the systems they live in?*

Yes, given the information that accompanies the matrices in the text. However, the case-by-case determination of the rankings is not explicit, and this is understandable given the involved methodology and the space that would be required to present it. There is a trade-off between detail and readability of the document.

e. Are the habitat types as defined in the matrices sufficient?

The habitat types as defined in the matrices are sufficient. On first appearance, the focus seems primarily on the physical and chemical (abiotic) characteristics of the habitat, and indirectly on the biotic characteristics. Abiotic characteristics will to a large extent dictate biotic habitat, however, this will be somewhat incomplete. For example, it may miss changes to ecosystem structure that may be important. However, the measures of water quality that address aquatic insect community structure and of riparian habitat go a long way to address this.

f. Are the linkages between habitat types and life stages correct and complete?

On the whole the linkages between habitat types and life stages appear correct and complete. I do question, however, why riparian habitat conditions are not linked to the egg life stage. The riparian habitat will affect water temperature and possibly other characteristics of the biological community associated with stream substrate (e.g. algal communities through light conditions).

g. Does the protocol for threats assessment have a high likelihood of correctly identifying the dominant stressors for each population?

Yes, I believe the protocol has a high likelihood of correctly identifying the dominant stressors for each population where there is sufficient information to do so. Information scarcity is likely to be the major impediment.

h. Does the threats assessment adequately focus and discuss the biological stresses to coho salmon as a result of the physical processes that have been affected (i.e., threats)? Are there others that should be considered?

The threats assessment does link effectively with the biological stresses to coho salmon through not only the physical, but also the chemical and ecosystem processes that have been affected. To my knowledge, there are no others that should be considered, except possibly affects on algal communities, as mentioned above.

i. Are the metrics developed and utilized to describe physical conditions of coho habitats adequate for the species, repeatable and measureable as described in the Recovery Planning Guidance?

The metrics developed and utilized to describe physical conditions of coho habitats, as presented in Table 4.2-1 of the recovery planning document, do appear adequate for the species and suitable justification for the rankings is provided in the text of chapter 4, along with appropriate citations. Clearly, additional, more detailed metrics could be added, but there is trade-off between detail and practicality of measurement. Temperatures during the incubation period, however, might be a useful metric to add, particularly given that climate change is expected to have its most dramatic effects during winter. There are metrics included that may be difficult to obtain in a repeatable fashion. For example, invertebrate EPT index and Richness are both likely to vary seasonally within a stream, making repeatability difficult. It is also striking that a number of metrics, particularly regarding sediment supply, are likely intercorrelated. This raises the

question whether just one or two of these measures might be sufficient to capture the necessary information.

13. *Does the recovery plan adequately address potential uncertainties related to threats assessment?*

In general, the recovery plan is poor at explicitly addressing the issue of uncertainty. Williams et al. (2006, 2008) provide some discussion of uncertainty regarding historical population structure and viability criteria, but little of this has been incorporated into the recovery plan document itself. There will clearly be uncertainties surrounding the determination of threshold criteria for threats assessment and the measurement of stress and threat indicators. Some explicit discussion of potential uncertainties is warranted within the recovery plan.

14. *Are the color coded CAP Threats Assessment summary pages which display population/watershed stresses and stressors useful for conveying to the public, agencies, stakeholders, what is needed to restore coho salmon and their critical habitats and why?*

Yes, the summary pages are particularly useful for conveying what is needed to restore coho salmon and their critical habitats. They provide a means of readily accessing key information that is consistently presented across the 45 different populations. At a quick glance, the public, agencies and stakeholders can get an idea of what is required for restoration. Also, the summary page will provide a useful means of tracking the effectiveness of restoration actions that have been implemented (i.e. through color-coded changes in the ranking of threats).

Questions Regarding the Conservation Assessment Process

15. *Does the plan adequately assess the effectiveness of conservation actions to date including, if the action was in place before listing and the reasons why the efforts were considered insufficient?*

Section 2.2.6 (Current Conservation Measures to Address Threats) in combination with section 2.2.4 (Inadequacy of Existing Regulatory Mechanisms) of the recovery plan provides an adequate overview of the effectiveness of conservation actions to date. The assessments in Section 2.2.6 provide information on the date when the action was put in place (some are still in the process of being implemented), and in most cases, their strengths and/or weaknesses are noted. Furthermore, each population profile provides additional information on conservation actions taken to date specific to the population itself. This hierarchical presentation of the conservation actions, i.e. those acting across the ESU and those that are population-specific, provides an effective means of assessing what has occurred, when it occurred, what scale it occurred at, and how effective it has been.

16. *Is it clear what threats are being addressed through conservation efforts and what threats remain unaddressed?*

Those conservation efforts operating across the ESU, in general, are explicit in the threats that are being addressed and less so in terms of the threats that remain unaddressed. An exception is the description of tribal land management, which provides little insight into the conservation actions being taken other than that they involve land management practices. At the population-specific level (i.e. population profiles), the threats being addressed through conservation efforts are often clear; an exception being where information about the current status of the program is lacking. Information about the threats that remain unaddressed is also available in cases where population-specific assessments have been undertaken.

Questions Regarding the Recovery Strategy

17. *If the species (ESU) met all the biological and physical threats abatement recovery criteria, is it plausible that this species would likely persist for the foreseeable future?*

It is reasonable to assume that if the SONCC coho salmon ESU met all the biological and physical threats abatement recovery criteria it would likely persist for the foreseeable future. These recovery criteria, however, would need to be met across a reasonable temporal scale (i.e. several years). One concern is the uncertainty that surrounds climate change and the increased volatility that is expected. However, the recovery plan as presented in this document recognizes the need to preserve diversity and connectivity in order maximize the likelihood of persistence and the capacity of populations to adapt to climate change.

18. *Are the Population Profiles contained within the plan adequate in summarizing the technical information assimilated for each historic coho salmon population and in conveying what is needed to recover/reduce the threats affecting the population?*

To the best of my knowledge, the population profiles are adequate in summarizing the technical information assimilated for each historic coho population. (Note I do not have a good overview of the technical information that was available) Clearly, there was limited information available in many cases and thus the reasoned approach of combining historical records with a predictive GIS model was used to develop a measure of intrinsic potential of a watershed (measured in kilometers). The population profiles also appear adequate in conveying what is needed to recover/reduce the threats affecting the population given the data/information limitations. Importantly, they provide a valuable base from which to build upon as more data/information become available.

19. *Do the recovery strategy and recovery criteria adequately consider large-scale environmental perturbations such as climate change and ocean variability?*

As discussed previously, the recovery plan does consider large-scale environmental perturbations such as climate and ocean variability (the latter will be linked to the former to some extent) in sections 2.2.5 and 6.2.5. Clearly, such perturbations will play an important role in recovery. Not

only do the recovery strategy and criteria recognize the need to preserve diversity and connectivity among populations, but also the need for actions that will improve habitat form and function (e.g. flows, riparian habitats, re-establishment of other physical and biological processes that support coho salmon habitat).

20. *Are the links between human activities, effects on habitat, effects on individual fish, and expected responses of populations clearly described?*

The recovery strategies outlined for the ESU, as well as by diversity stratum and population (chapters 7 and 11) clearly link human activities, effects on habitat, effects on individual fish, and expected responses. In some cases, recovery may take decades and responses of populations will be slow.

21. *Does the recovery plan contain a logical framework for prioritizing recovery efforts at multiple spatial scales? Such as:*
    a. *For each of these populations, have the primary stressors been identified?*

An attempt has been made, where information allows, to identify the main stressors for each population. These stressors flow logically from the matrix summarizing the severity of stresses affecting each life stage. The supporting text provides justification for the prioritization and the layout of the population profiles makes it easy for the reader to follow the logic.

    b. *Given the prioritized stressors, do the recovery actions have a high likelihood of achieving measurable results?*

If recovery actions can be implemented appropriately and followed through on, I believe that many of the recovery actions have a high likelihood of achieving measurable results. As mentioned with regards to question 20 above, it must be recognized that in some cases recovery may take decades and responses of populations will be slow.

    c. *Is there a logical link between stressors, populations and prioritized recovery actions such that they will have the highest likelihood for success?*

Yes, the format of the population profiles together with the stresses and threats matrices provide a logical link that will help in the prioritization of recovery actions that can have the greatest impact on recovery. However, the likelihood for success will depend on more than simply identifying the highest priority recovery actions and would need to involve consideration of the ease, speed and likelihood of successful implementation of the action.

22. *Do the proposed recovery actions link logically to the threats identified in the CAP Threats Assessment?*
    a. *Do proposed recovery actions target the primary stresses/stressors for each population?*

The proposed recovery actions do, in general, target the primary stresses/stressors for each population, flowing logically from the stresses and threats matrices.

b. Are recovery actions prioritized in a manner consistent with identified threats?

In general, recovery actions are prioritized in a manner consistent with identified threats. An exception, however, concerns roads which are frequently identified as high or very high threats but not given priority in recovery actions. While not explicitly stated (it might be useful to do so however), this likely reflects the difficulty in undertaking this threat abatement (i.e. removing roads).

Question Regarding Monitoring and Adaptive Management

23. *Does the plan have a well-defined methodology for adaptive management to evaluate whether recovery measures are producing the intended effects and, if not, for informing mid-course corrections in the recovery plan and its implementation*?

The draft recovery plan that was reviewed lacked a well-defined methodology for adaptive management. It was noted in the letter to reviewers from the NMFS Southwest Region Arcata Area Office that this section of the report was incomplete. An appropriate adaptive management plan will be central to evaluating the effectiveness of recovery measures and for allowing mid-course corrections, if and where necessary.

4. Conclusions and Recommendations

The draft recovery plan is successful in identifying reasonable actions necessary for the conservation and survival of the Southern Oregon/Northern California Coast Coho Salmon Evolutionary Significant Unit. In the development of the plan, use has been made of some of the best available scientific, technical and commercial data and information. Improvements, however, could be made with regards to the delineation of aspects of coho salmon biology and life history pertinent to the ESU's endangerment and recovery. Also, the derivation of some of the stress and threat criteria thresholds would benefit from a more explicit foundation in scientific knowledge. Details were not provided by which to evaluate the appropriateness of the use of professional judgement in stress and threat ranking (there are fields of study on the best use and interpretation of such information). It is recommended that once the methodology is available for examination, it be reviewed by independent experts to ensure the appropriateness of the approach.

Interpretation and application of the NMFS' Southwest Fisheries Science Center SONCC TRT supporting reports, particularly those of Williams et al. (2006, 2008), was appropriate. These TRT reports provide fundamental information and support for the approach applied in the recovery plan document. They begin the development of the conceptual framework of coho salmon populations as the fundamental unit of recovery that exists within the hierarchy of biological organization that includes diversity strata essential to the viability of the ESU. The foundation for the historical population structure of the SONCC coho salmon ESU used in the recovery document has its origins in Williams et al. (2006). From this, Williams et al. (2008)

develops the framework used for assessing viability within the ESU, which is interpreted and applied in the present recovery plan. This framework consists of criteria and rules supported by scientific literature and/or professional judgement. While Williams et al. (2008) recognize the uncertainty that surrounds the approaches they use and the threshold values of the criteria developed, this is not applied/noted in the recovery plan document. It is recommended that the recovery plan document explicitly do so, allowing the reader of the document to appreciate the degree of uncertainty surrounding aspects of the methodologies being applied and what it means for the interpretation of the findings.

The processes developed for and methods used provide adequate linkages between the stress and threat assessments and the ESU recovery criteria, such that appropriate recovery actions and strategies are developed that are likely to reduce or abate population threats and increase the likelihood of ESU viability. It is recommended that an adaptive management plan be central to evaluations of the effectiveness of recovery measures and for identifying appropriate adjustments. Linked to this is a need for increased, yet focused research and monitoring to meet key data needs as identified through the recovery plan. It will be a significant challenge to develop and implement technical tools to assess, as well as forecast impacts, particularly in a variable and changing environment (e.g. climate change).

Appendix 1 – Bibliography of Materials Used

Elliott, J.M. 1994. Quantitative ecology and the brown trout. Oxford University Press, Oxford.

Coronado, C. and R. Hilborn, R. 1998. Spatial and temporal factors affecting survival in coho salmon (*Oncorhynchus kisutch*) in the Pacific Northwest. *Canadian Journal of Fisheries and Aquatic Sciences* 55: 2067–2077.

Einum, S. and I.A. Fleming. 2000a. Highly fecund mothers sacrifice offspring survival to maximize fitness. Nature 405: 565-567.

Einum, S. and I.A. Fleming. 2000b. Selection against late emergence and small offspring in Atlantic salmon. Evolution 54: 628-639.

Flanagan, S. and G. Bryant. 2008. SONCC coho salmon recovery planning population profile – guidance document. 14 August 2008.

Fleming, I.A. 1998. Pattern and variability in the breeding system of Atlantic salmon, with comparisons to other salmonids. Canadian Journal of Fisheries and Aquatic Sciences 55(Suppl. 1): 59-76.

Fleming, I.A. and M.R. Gross. 1992. Reproductive behaviour of hatchery and wild coho salmon (*Oncorhynchus kisutch*): does it differ? Aquaculture 103: 101-121.

Fleming, I.A. and M.R. Gross. 1993. Breeding success of hatchery and wild coho salmon (*Oncorhynchus kisutch*) in competition. Ecological Applications 3: 230-245.

Fleming, I.A., and M.R. Gross. 1994. Breeding competition in a Pacific salmon (coho: *Oncorhynchus kisutch*): measures of natural and sexual selection. Evolution 48: 637-657.

Godfrey, H. 1965. Salmon of the North Pacific Ocean – part IX. Coho, Chinook and masu salmon in offshore waters. 1. Coho salmon in offshore water. International North Pacific Fisheries Commission Bulletin 16:1-39.

Hobday, A.J. and G.W. Boehlert. 2001. The role of coastal ocean variation in spatial and temporal patterns in survival and size of coho salmon (Oncorhynchus kisutch). Canadian Journal of Fisheries and Aquatic Sciences 58: 2021–2036.

Koslow, J.A., A.J. Hobday and G.W. Boehlert. 2002. Climate variability and marine survival of coho salmon (Oncorhynchus kisutch) in the Oregon production area. Fisheries Oceanography 11: 65–77.

Lawson, P.W., E.A. Logerwell, N.J. Mantua, R.C. Francis and V.N. Agostini. 2004. Environmental factors influencing freshwater survival and smolt production in Pacific Northwest coho salmon (*Oncorhynchus kisutch*). Canadian Journal of Fisheries and Aquatic Sciences 61: 360-373.

Logerwell, E.A., N. Mantua, P.W. Lawson, R.C. Francis and V.N. Agostini. 2003. Tracking environmental processes in the coastal zone for understanding and predicting Oregon coho (Oncorhynchus kisutch) marine survival. Fisheries Oceanography 12: 554–568.

McElhany, P., M.H. Ruckelshaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Dept. Commer, NOAA Tech. Memo. NMFS-NWFSC-42, 156p.

NMFS 2007. Interim Endangered and Threatened Species Recovery Planning Guidance, Version 1.2. September 2007.

National Research Council. 2004. Endangered and Threatened Fishes in the Klamath River Basin: Causes of Decline and Strategies for Recovery. NRC of the National Academics. The National Academies Press, Washington, D.C. 334 p.

Quinn, T.P. 2005. The behaviour and ecology of Pacific salmon and trout. University of Washington Press, Seattle.

The Nature Conservancy. 2005. Conservation action planning. Developing strategies, taking action and measuring success at any scale. Overview of basic practices. 17 June 2005.

van den Berghe, E.P. and M.R. Gross. 1984. Female size and nest depth in coho salmon (*Oncorhynchus kisutch*). Canadian Journal of Fisheries and Aquatic Sciences 41: 204-206.

Weitkamp, L.A., T.C. Wainwright, G.J. Bryant, G.B. Milner, D.J. Teel, R.G. Kope, and R.S. Waples. 1995. NMFS Status Review of Coho Salmon from Washington, Oregon and California. NOAA Technical Memorandum NMFS-NWFSC-24, September 1995.

Williams, T.H., E.P. Bjorkstedt, W.G. Duffy, D. Hillemeier, G. Kautsky, T.E. Lisle, M. McCain, M. Rode, R.G. Szerlong, R.S. Schick, M.N. Goslin and A. Agrawal. 2006. Historical Population Structure of Coho Salmon in the Southern Oregon/Northern California Coasts Evolutionarily Significant Unit. U.S. Department of Commerce, NMFS, NOAA Fisheries SWFSC Santa Cruz, NOAA Technical Memorandum NMFS-SWFSC-390, June 2006.

Williams , T.H., B.C. Spence, W.G. Duffy, D. Hillemeier, G. Kautsky, T.E. Lisle, M. McCain, T.E. Nickelson, E. Mora and T. Person. 2008. Framework for Assessing Viability of Threatened Coho Salmon in the Southern Oregon/Northern California Coasts Evolutionarily Significant Unit. U.S. Department of Commerce, NOAA Technical Memorandum NOAA Fisheries SWFSC Santa Cruz, NOAA Technical Memorandum NMFS-SWFSC-432, December 2008.

Appendix 2 – Statement of Work for Dr. Ian A. Fleming

External Independent Peer Review by the Center for Independent Experts (CIE)

REVIEW OF THE 2009 NATIONAL MARINE FISHERIES SERVICE'S SOUTHERN OREGON/ NORTHERN CALIFORNIA COAST (SONCC) COHO SALMON DRAFT RECOVERY PLAN

Scope of Work and CIE Process: NOAA's National Marine Fisheries Service's (NMFS) Office of Science and Technology manages a contract through the Center for Independent Experts (CIE) to conduct impartial and independent peer reviews of NMFS scientific projects. This Statement of Work (SoW) described herein was established by the NMFS Contracting Officer's Technical Representative (COTR) based on the peer review requirements submitted by NMFS Project Contact. CIE reviewers will be selected by the CIE Coordination Team and Steering Committee to conduct the external peer review of NMFS science with project specific Terms of Reference (ToRs). Each CIE reviewer shall produce a CIE independent peer review report with specific format and content requirements (**Annex 1**). This SoW describes the work tasks and deliverables for conducting the CIE peer review of the following NMFS project.

Project Description: The Endangered Species Act (ESA) requires NMFS to develop and implement recovery plans for the conservation of threatened and endangered species. The Southern Oregon/Northern California Coast (SONCC) Coho Salmon Evolutionarily Significant Unit (ESU) includes all naturally spawning coho salmon from the Elk River near Cape Blanco in southern Oregon south through the Mattole River near Punta Gorda in Northern California. This ESU contains three large river basins, including the Rogue River in Oregon and the Klamath-Trinity and Eel Rivers in California that extend inland considerable distances. The draft recovery plan serves as a guideline for achieving recovery goals by describing the steps that must be taken to improve the status of the species and their habitats. Although the recovery plan itself is not a regulatory document, its primary purpose is to provide a conservation "road map" for Federal and state agencies, local and Tribal governments, non-governmental entities, private businesses, and stakeholders. Development of this recovery plan is a challenge as the geographical range of the species crosses the Oregon/California border. In addition, the recovery plan will adapt portions of the "Recovery Strategy for California's Coho Salmon, recently listed under California's ESA (CESA) in 2005" and conservation, recovery efforts and strategies developed for southern Oregon coho salmon populations under the State of Oregon's Native Fish Conservation Policy.

The NMFS Recovery Plan for the SONCC Coho is expected to generate substantial interest from outside parties because it: (1) will contain recommendations involving water supplies for a variety of industrial, commercial, agricultural and urban users and municipalities; (2) will prioritize targeted restoration and recovery actions for coho salmon populations and watersheds throughout southern Oregon and northern California; (3) could influence local and regional environmental planning efforts and decisions involving land development patterns; and (4) may advise federal, state, tribal, local and regional governments on actions necessary to reduce the threats causing biological stresses to coho salmon populations and their critical habitats. The draft recovery plan will include a large geographic area in Southern Oregon and Northern

California and has the potential for wide-ranging implications. The threats assessment process used in the draft plan represents a new approach for anadromous salmonid ESA protected species and has been completed by NOAA Fisheries in full cooperation and coordination with state, federal, local, and regional governments and agencies. Stakeholder interest will be high and likely lead to inquiries from elected representatives at the state and Federal levels. The Terms of Reference (ToRs) of the CIE peer review are specified in **Annex 2**.

Requirements for CIE Reviewers: Three CIE reviewers shall conduct an impartial and independent peer review in accordance with the SoW and ToRs herein. Each CIE reviewer's duties shall not exceed a maximum of 10 days to complete all work tasks of the peer review described herein. CIE reviewers shall have the expertise, background, and experience to complete an independent peer review in accordance with the SoW and ToRs herein. The CIE reviewers shall have expertise with strong credentials in salmon management, salmon conservation biology, salmon restoration practices, salmon/water management, and salmon conservation under the Endangered Species Act.

Location of Peer Review: The CIE reviewers shall conduct the external peer review of the report as a desk review, in which no travel is required.

Statement of Tasks: Each CIE reviewer shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

Prior to the Peer Review: Upon completion of the CIE reviewer selection by the CIE Steering Committee, CIE shall provide the CIE reviewer information (name, affiliation, and contact details) to the COTR, which will be sent to the NMFS Project Contact no later the date specified in the Schedule of Milestones. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project Contact is responsible for providing the CIE reviewers with the background documents and reports to be peer reviewed. Changes to the SoW or ToRs must be made through the COTR prior to the commencement of the peer review.

Background Documents: At the commencement of the peer review, the NMFS Project Contact will send by electronic mail, or make available at an FTP site, the CIE reviewers all necessary background information and the report for the peer review. If the documents need to be mailed to the reviewer, the NMFS Project Contact will consult with the CIE on where to send the documents.

A tentative list of background documents and the report is provided in Annex 3, and an updated list will be provided up to two weeks before the peer review. Any delays in submission of review documents for the CIE peer review will result in delays with the CIE peer review process, including a SoW modification to the schedule of milestones and deliverables. Furthermore, the CIE reviewers are responsible only for the documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein.

Desk Peer Review: Each CIE reviewers shall conduct the independent peer review in accordance with the SoW and ToRs. **Modifications to the SoW and ToRs can not be made**

during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COTR and CIE Lead Coordinator.

Contract Deliverables - Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review report according to the format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

Specific Tasks for CIE Reviewers: The following chronological list of tasks shall be completed by each CIE reviewer in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review;
2) Conduct an independent peer review in accordance with the SoW and ToRs (Annex 2);
3) No later than 29 June 2009, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts," and sent via email to Manoj Shivlani, CIE Lead Coordinator shivlanim@bellsouth.net, and CIE Regional Coordinator, David Die ddie@rsmas.miami.edu. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in Annex 2;
4) CIE reviewers shall address changes as required by the CIE review in accordance with the schedule of milestones and deliverables.

Schedule of Milestones and Deliverables: CIE shall complete the tasks and deliverables described in this SoW in accordance with the following schedule.

1 June 2009	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
15 June 2009	NMFS Project Contact sends the CIE Reviewers the report and background documents for the peer review no later than this date.
15-29 June 2009	Each reviewer conducts a desk (requiring no travel) peer review
29 June 2009	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
12 July 2009	CIE submits CIE independent peer review reports to the COTR
26 July 2009	The COTR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

Modifications to the Statement of Work: Requests to modify this SoW must be made through the Contracting Officer's Technical Representative (COTR) who submits the modification for approval to the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the CIE within 10 working days after receipt of all required information of the decision on substitutions. The COTR can approve changes to the milestone dates, list of pre-review documents, and Terms of Reference (ToR) of the SoW as long as the role and ability of the CIE reviewers to complete the SoW deliverable in accordance with the ToRs and deliverable schedule are not adversely impacted. The SoW and ToRs cannot be changed once the peer review has begun.

Acceptance of Deliverables: Upon review and acceptance of the CIE independent peer review reports by the CIE Lead Coordinator, Regional Coordinator, and Steering Committee, these reports shall be sent to the COTR for final approval as contract deliverables based on compliance with the SoW. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (the CIE independent peer review reports) to the COTR (William Michaels, via William.Michaels@noaa.gov).

Applicable Performance Standards: The contract is successfully completed when the COTR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards: (1) each CIE report shall have the format and content in accordance with Annex 1, (2) each CIE report shall address each ToR as specified in Annex 2, and (3) the CIE reports shall be delivered in a timely manner as specified in the schedule of milestones and deliverables.

Distribution of Approved Deliverables: Upon notification of acceptance by the COTR, the CIE Lead Coordinator shall send via e-mail the final CIE reports in *.PDF format to the COTR. The COTR will distribute the approved CIE reports to the NMFS Project Contact and regional Center Director.

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