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May 31, 1991

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Gentlemen:

The attached document provides Exxon Shipping Company's comments on the 1991 State/Federal Natural Resource Damage Assessment and Restoration Plan for the Exxon Valdez Oil Spill. Review of the 1991 Plan strengthens our conviction that the current Valdez NRDA process continues the errors of prior years relative to the statutory goal of identifying necessary restoration programs.

The 1991 Plan, like previous NRDA programs, does not represent an unbiased scientific assessment. It continues to search for phantom injuries, focusing on chemical and biologic differences at the microscopic level. No comparable attempts are made to record and report the health and vitality of the abundant and thriving biota currently in the area.

The prodigious Prince William Sound pink salmon and herring fisheries in 1990, followed by the second largest annual herring catch in 1991, provide indisputable evidence of the abundance and health of these most significant fish species. Likewise, the results of water quality studies of unprecedented scope conducted by several leading environmental firms demonstrate the water column never represented a serious threat to marine species and, in fact, has been at background hydrocarbon levels since mid-1989. Numerous additional examples of the health of the ecology are cited in Exxon's submittal to the U.S. District Court for Alaska dated April 16, 1991 (copy attached).

This year's plan goes even further afield by introducing projects with no relevance to damage assessment. The 1991 Plan incorporates the Oil Spill Public Information Center as a nearly $3 million budget item; this public library contributes nothing to the assessment process and so, is irrelevant. Likewise, the study aimed at defining spill effects on gasoline prices has no relationship to natural resource injuries.

A well developed, unbiased assessment of natural resource damages would consider all aspects and would look critically at the need and justification for any restoration steps beyond the cleanup that has already been performed. Such justification would include an evaluation of the merits giving consideration to the benefits versus the cost of alternatives. The combined 1989-91 NRDA programs fail to meet the requirements of a sound scientific program. Further, the NRDA programs have consistently deviated from the Department of Interior regulations.

The NRDA programs would have been better designed and less wasteful had they not been shrouded in secrecy as directed by the government's attorneys, allowed the PRP to participate, and focused on an assessment of restoration needs as required by regulations.

Sincerely,

AE:hh
Attachment

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EXXON SHIPPING COMPANY

THE 1991 STATE/FEDERAL NATURAL RESOURCE DAMAGE ASSESSMENT AND RESTORATION PLAN FOR THE EXXON VALDEZ OIL SPILL

REVIEW COMMENTS
JUNE 3, 1991

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EXECUTIVE SUMMARY

Introduction

This document provides Exxon Shipping Company's (ESC) comments on The 1991 State/Federal Natural Resource Damage Assessment and Restoration Plan for the Exxon Valdez Oil Spill ("Plan") published by the NRDA Trustee Council. The Introduction to the Plan states that it continues or modifies certain 1989 and 1990 damage assessment studies as described in the 1989 Draft Plan and the 1990 Plan. It also suggests that consideration was given to the public comments on the first two years of work in the development of the 1991 Plan.

The statutes and regulations controlling the Natural Resource Damage Assessment (NRDA) process clearly require that studies and work undertaken by the resource trustees focus on the restoration of injured natural resources. The Clean Water Act establishes that the cost of restoring, replacing, or acquiring the equivalent of the injured resources is the measure of natural resource damages recoverable from an oil spill. The D. C. Circuit Court of Appeals in Ohio v. Department of Interior held that restoration is the primary objective of the NRDA process as prescribed in the Department of Interior's (DOI) regulations.

The 1991 Plan, as was true with its 1989 and 1990 predecessors, must therefore be judged by its ability to identify requirements for, and reasonable costs of, restoration of injured resources. A critical factor in making this assessment must be the measurement of natural recovery. It is against this backdrop of law and regulation that ESC has evaluated the 1991 Plan's merits and offers the following comments.

Comments on Overall Process

The current NRDA process as described by the 1989, 1990, and 1991 Plans will not efficiently identify meaningful restoration needs.

The 1991 Plan lacks a balanced perspective and is not designed to provide an objective assessment of spill injuries and restoration needs. It is apparent

that litigation interests have driven the program in an attempt to maximize potential damage claims. The scientists have been allowed to focus the studies on minor chemical and biological differences at the microscopic level. This approach will produce a biased, one-sided view of the environment; it completely ignores the overwhelming evidence of the vitality of the ecosystem as a whole and will not identify the steps, if any, needed to restore the resources. Thus, the damage assessment process does not give due consideration to the overall condition of the spill-affected area, does not follow the statutes and the DOI regulations, and is clearly off track.

The rapid recovery and overall health of the ecology have been widely documented in published studies that have confirmed that the water is clean, fish are abundant and safe to eat, the wildlife is likewise abundant and thriving, and the shorelines have been essentially cleaned. The studies supporting these conclusions have all been available to the public for some time, and were recently summarized as part of Exxon's filing in the U. S. District Court in Alaska (copy attached) in response to the "Summary of Injuries to Natural Resources as a Result of the Exxon Valdez Oil Spill", 56 FR 14687, (April 11, 1991) which was prepared by the federal natural resource trustees and EPA, ("Summary of Injuries").

The Trustee Council's NRDA process has evolved into a program of scientific inquiry which appears to be limited to a chase of phantom injuries. Even after this intensive search for injuries and the expenditure of $70 million dollars on previous studies (1989 and 1990) no significant restoration needs have been identified. As a result, the Trustee Council has turned to public input to develop a restoration "wish list," an approach which presumes rather than establishes injury and the resulting need for pro-active restoration.

Finally, the Trustee Council's litigation interests have shrouded the entire scientific process in a cloak of secrecy; one in which the misperception of continuing environmental catastrophe can be carefully maintained for the purpose of maximizing hypothetical damages. When interviewed by Science magazine, Arthur Wiener, a biologist for the state's Department of Natural

Resources and one of the state's principal investigators for the spill, indicated that "We all knew when we signed on that we were being paid by the state to get ready for litigation....It's the attorneys who are running the show here." In that same article, former Alaska state attorney Doug Bailey admitted "The job of state scientists in this case is to further the interest of the state, not the interest of science." (Science, Vol. 252, May 10, 1991)

This effort to obscure the rapidly recovering ecology of the spill-impacted area is further exemplified by the "Summary of Injuries" which is apparently designed to attempt to maximize its legal claims rather than to accurately inform the public concerning the state of the environment. This "Summary of Injuries" failed to provide any supporting data or analysis on which the seriousness of its findings can be evaluated and completely disregards scientific evidence of the abundance of wildlife and other indicators of the overall ecological health of the area.

The public participation process continues to be an ineffective, bureaucratic sham.

The Trustee Council's use of the NRDA process as a vehicle for litigation has rendered the often-touted public participation process little more than a bureaucratic sham. The Trustee Council's response that the Plan is only intended to provide notice of their intent to conduct studies is inconsistent with a meaningful and unbiased scientific review. In this context the process is little more than a public notification process rather than the public review process mandated by the regulations.

Additionally, no attempt has been made to involve the scientific community in a broader, unbiased assessment of spill effects. No substantive data have been released and meaningful comment by the scientific community as a whole has been frustrated by a lack of even rudimentary information concerning the individual studies.

Since the beginning, the potentially responsible parties (PRP) have been systematically excluded from any meaningful participatory role, in open defiance of the Department of Interior's (DOI) regulations. This exclusion is evident in the notable absence of the PRPs from the planning process. The DOI clearly recognized the advantages of PRP participation in the damage assessment process as did a study by the University of Washington on behalf of the Washington State Legislature (A Proposed Resource Damage Assessment Methodology for Washington State, Geselbracht, et.al, 1989 Oil Spill Conference). The Trustee Council's exclusion of the PRPs from meaningful participation has resulted in:

1) An ill-focused process that will fail to clearly link measured differences between previously oiled and reference sites to specific, oil-spill-related restoration needs.

2) A substantially prolonged process that will delay the timely implementation of restoration activities and seriously limit their effectiveness.

3) A wasteful process in which monies are spent on ill-advised studies that have little, if any, chance of identifying cost-effective restoration activities.

In contrast to claims by the Trustee Council that the PRPs are asking for special privileges in the public review process, the PRPs are instead only asking that they be afforded those rights and privileges originally envisioned and clearly communicated by the DOI when the regulations were promulgated.

The voluminous response to comments on the 1990 Plan (Appendix D of Plan) clearly indicates that the Trustee Council has expended considerable energy on a point-by-point rebuttal of prior comments, rather than considering how the overall program should be re-focused. This approach has virtually ensured that the present Plan incorporates most, if not all, the substantive and procedural deficiencies of the 1989 and 1990 Plans. Further, the Council has missed the

basic message repeated by most reviewers; the process itself is off track and headed for failure.

Technical Comments

There is clear evidence that the 1991 technical studies are still not focused on the goal of the NRDA process, which is to determine the steps beyond natural recovery needed to restore the natural resources and the services which those resources provide.

The studies continue to ignore obvious indicators of natural recovery and overall ecological health.

The NRDA process implemented by the Council appears to ignore any indication that many of the natural resources in the affected area have virtually recovered from spill effects, if any, and no further study is justified. Instead of recognizing this fact and drawing the reasonable conclusion that no further study is warranted, the healthy state of many resources has caused the Council to redirect their studies to the microscopic level in search of any anomaly which might somehow be attributed to the spill.

This deficiency is perhaps most clearly evident in the "Summary of Injuries", which is generally devoid of observations recognizing the healthy state of the ecology. Missing, for example, is any reference to the highly successful herring (8300 tons) and pink salmon (44.7 million) catches in 1990 that underscored the robust health of the Prince William Sound (PWS) fisheries in general. While unknown at the time the Plan was developed, the just completed 1991 purse seine herring fishery also points to the robust health of these fisheries. This was the second largest catch ever recorded at 11,924 tons; 44% larger than even the 1990 catch and 62% larger than the average harvest from 1980 through 1990 (excluding the 1989 closure). Surely, such overwhelming evidence of the vitality of the fisheries should be enough to halt the waste of further resources on yet more fishing studies.

Also noticeably absent from the Plan is any reference to the results of the subsistence sampling program conducted jointly by the National Oceanic and Atmospheric Administration (NOAA), the Alaska Department of Fish and Game (ADF&G) and Exxon which provides convincing evidence that fish from throughout the spill-impacted area do not contain hydrocarbons above normal background levels. No problems were found to exist with shellfish, except for those collected from the very few obviously oiled areas. Even then, the risks of consumption, if any, were found to be extremely low.

As early as 1990, the shoreline conditions were deemed by NOAA to pose no significant threat to wildlife (see NOAA's report on Net Environmental Benefit Assessment), yet the studies continue. Furthermore, the State's own game management policies are inconsistent with the Trustee Council's claims of widespread and long-term devastation to wildlife. Studies of brown bear (TM4) and waterfowl (B11) disregard the fact that continued permitted sport hunting of these species in the spill-impacted area is a clear acknowledgement that a harvestable surplus exists.

The bald eagle study (B4) completely disregards the results of the USF&WS eagle survey conducted last year which clearly revealed the success of the 1990 breeding season, the subsequent survival of fledglings, and the overall successful recolonization of previously spill-impacted areas. Study B4 also neglects the fact that eagles examined from heavily oiled areas in 1989 showed no abnormal blood characteristics.

NOAA, in its role as cleanup advisor to the Coast Guard, has also observed and commented on the rapid ecological recovery of the spill-impacted area. With particular reference to the flora and fauna of the intertidal communities in both PWS and the Gulf of Alaska (GOA), NOAA has observed "The NOAA monitoring program indicates that even where there is direct contact with weathered oil, intertidal organisms have shown extensive recovery" (1991 NOAA review of shoreline status, transmitted to Admiral Ciancaglini of the Coast Guard by D. M. Kennedy of NOAA; March 15, 1991). This preponderance of positive evidence casts serious doubt on the justification behind the entire Coastal Habitat

Study (CH1). This study's justification is all the more unwarranted when judged against the likelihood of identifying pro-active restoration programs.

The studies exhibit an absence of restoration focus.

The Trustee Council's proposal to conduct yet another $35 million science and economics program in spite of the excellent state of natural recovery already experienced by the affected area clearly illustrates that the studies have virtually no connection to the identification of justified restoration programs. Instead, the 1991 studies are best characterized as microscopically and/or academically focused science. For example, the use of mixed function oxidase (MFO) levels in fish tissues as a means of assessing hydrocarbon contamination is clearly research. The use of parameters such as MFOs and cytogenetics to demonstrate injury is an unproven technique which can show a great deal of variability between different life stages, seasonal factors, and food sources.

Biochemical measurements, such as bile fluorescent aromatic hydrocarbon concentrations and enzyme level changes, are non-specific indicators of hydrocarbon exposure, are highly variable due to purely natural causes, cannot be directly or positively related to the Exxon Valdez oil spill (EVOS), and cannot be correlated with population level impacts (FS2, FS13).

The study designs continue to be deficient in many aspects.

The studies described in the 1991 Plan are replete with examples of design deficiencies.

- Failure to consider natural recovery. One of the most obvious deficiencies in study design is the failure to recognize and adequately assess the potential for and pace of natural recovery. The DOI regulations clearly require that natural recovery be included as a potential restoration option, yet the studies continue to focus only on the determination of minute injuries. They fail to put the extent of

injuries into any kind of perspective. For example, no consideration is given to the large fraction of the shorelines that went untouched by the spill, the vast populations of wildlife that inhabit the spill-affected area, or even the increasing evidence of recolonization of previously oiled areas. Without this perspective, any justification offered by the Trustee Council for restoration needs will be virtually meaningless.

- Other factors responsible for change. Another design deficiency is the failure to recognize and adequately account for other factors which influence change. The simple realization that natural variability is induced by many factors (e.g. severe winters, predator/prey relationships, and disease) and can play a significant role in population trends or temporal variance is not reflected in the study designs (TM3, TM4). For example, it is also well known that populations of harbor seals (MM5) have been declining dramatically for unknown reasons over the last several decades. It is unreasonable to expect that the present study will be able to distinguish between these natural factors and those supposedly due to EVOS exposure.

  Likewise, a review of salmon population dynamics in PWS reveals a high degree of variability between stocks. Since differences between wild and hatchery stocks are not clearly understood by the fisheries managers of the area, it is not plausible to expect that the studies described in the Plan (FS2, FS3, FS4, FS5, FS11, FS27) will be able to adequately describe the subtleties of historical population dynamics with sufficient precision to assess the incremental impact of extremely low hydrocarbon levels.

  Confounding environmental variables such as weather and site characteristics (SS7, CH1) and alternate working hypotheses (SS5, MM2, MM5) are also inadequately considered in the study designs. This can only lead to errant conclusions as to injuries specifically due to EVOS exposure.

- Failure to quantify injury. Another major deficiency in study design is the failure to quantify injury to resources. For example, Bird Studies B2, B3, and B4 do not have either valid pre-spill data or suitable control sites for the assessment of injury from EVOS. It will also be difficult to establish a clear and unequivocal cause/effect relationship between chemical residue data (trace hydrocarbons in the environment) and histologic changes in marine mammals (MM5, MM6F, MM6G).

- Failure to establish exposure pathway. The studies fail to establish and document an obvious and continuing pathway for exposure to EVOS. While the immediate and acute effects of EVOS are undeniable, the rapid decrease in the level of EVOS hydrocarbons over time (as documented by Dr. Jerry Neff's report on "Water Quality in Prince William Sound and the Gulf of Alaska" and the jointly conducted shoreline surveys and subsistence monitoring studies) clearly demonstrates that continued exposure to hydrocarbon levels of concern is highly unlikely. The studies also fail to adequately distinguish between EVOS and other natural and/or anthropogenic sources of hydrocarbons.

- Studies not cost effective. While some of the studies may provide useful natural resource management information (TM3), this information is not needed for the EVOS damage assessment nor is it compensable under the DOI regulations. Further, several studies violate the regulatory requirement that the assessment costs not exceed the anticipated damage amount determined (e.g. FS11, TM3, TM4). This stipulation has apparently been overlooked by the Trustee Council who claim that it only applies to the overall assessment process and not on a study-by-study basis. Such an interpretation completely subverts the rational safeguards against wasteful spending incorporated in the DOI regulations.

  The Oil Spill Public Information Center (OSPIC) is the most blatant example of an expenditure of funds (almost $3 million) which has no

relevance to the identification of meaningful restoration options. This is clearly a non-compensable cost under either the Clean Water Act (CWA) or the DOI regulations.

This spendthrift attitude is also exemplified by Study B1 which will re-examine and catalogue bird carcasses for future distribution to interested universities and museums. It can serve no rational purpose in the determination of compensable injuries and meaningful restoration options under even the most lenient interpretation of the CWA or the DOI regulations.

Economic Comments

The 1991 economic studies continue to suffer from the same inadequacies that plagued the previous studies.

Previous study deficiencies in the 1989 and 1990 Plans included a visible absence of any description of the state's economic studies, the inclusion of studies clearly intended to assess noncompensable damages, a substantial likelihood of double counting, and dependance on contingent valuation -- an unproven and controversial method. These and other deficiencies continue to plague the 1991 studies.

The 1991 studies have gone even further afield.

Rather than reflecting on the inadequacies of the contingent valuation method as described in previous comments by the PRPs and revising the subject studies appropriately, the Trustees have further compounded the problem by suggesting the use of this unproven and highly controversial method to estimate the sum of intrinsic and use values (ECON7). This study now purports to estimate the "total value" of natural resources allegedly affected by the EVOS. Contingent valuation is an attempt to create a hypothetical marketplace in which people try to attach hypothetical prices to supposed goods like existence values which are not actually traded in any real market and which exist only as ideas. No

explanation is given for changing the study's scope to include the measurement of use values. It is incomprehensible why the Trustee Council would decide to use contingent valuation techniques to estimate lost use when other more reliable techniques are available.

Furthermore, contrary to statements in the Trustee Council's response to public comments on the 1990 Plan, contingent valuation is not an appropriate method for "valuing natural resource injuries." Nor was "use of contingent valuation ... approved by the court in Ohio v. Department of the Interior." The court offered the opinion that DOI should identify non-market assessment methods and that such methods include contingent valuation for some applications if the technique could be shown to be valid and accurate. This opinion was offered without reference to specific categories of non-market goods and services to which contingent valuation might apply. It must be assumed that the court did not intend to endorse a methodology which does not work, and contingent valuation has not been demonstrated to be a valid or reliable measure of non-use damages. Consequently, contingent valuation cannot be used to assess the non-use or total value (which includes non-use) of injured resources.

Restoration Planning

The few restoration studies identified in the Plan are ill-conceived and unwarranted. They clearly demonstrate the failure of the NRDA process to identify any significant restoration projects required to address actual injuries. The restoration studies described in the Plan are unchanged from the Draft 1991 Restoration Work Plan studies. ESC previously provided comments on the Draft 1991 Restoration Work Plan and, therefore, incorporates by reference those previous comments. A copy of those comments is included in the Appendix.

Legal and Regulatory

The 1991 Plan contains numerous deficiencies and errors with respect to both the CWA and the DOI Regulations for Natural Resource Damage Assessments (43 C.F.R. Part 11). ESC provided voluminous and detailed comments on the

deficiencies of the 1989 and 1990 Plans. The major legal deficiencies noted in those comments were that the Plans were not properly focused on restoration and ignored natural recovery, that they improperly calculated natural resource damages, that they improperly focused on impacts that do not give rise to damages, that they would result in double counting of damages, and that they failed to adhere to the DOI regulations. All of these deficiencies still exist in the 1991 Plan. Instead of restating the deficiencies found in the 1989 and 1990 Plans and described in ESC's comments on the 1989 and 1990 Plans, ESC incorporates those comments by reference. Set forth below are ESC's comments on additional legal or regulatory issues raised by the 1991 Plan.

The 1991 Plan fails to contain sufficient information to allow meaningful comment.

While the 1991 Plan was published in advance of the 1991 field season (unlike the 1989 and 1990 Plans), the 1991 Plan fails to contain information vital to understanding and evaluating the proposed studies and thereby limits, and often precludes, meaningful comment. Most significant is the omission of the results from the prior years' studies. It is impossible to understand or justify the need for the 1991 studies without access to the results of the 1989 and 1990 studies. In light of the publication of the "Summary of Injuries", it is inexcusable for the 1991 Plan not to contain the same information and a more explicit description of the bases for the assertions in the published "Summary of Injuries". For example, the "Summary of Injuries" asserts that up to 5,500 sea otters were killed by the spill, although only 1,011 carcasses were actually recovered. No scientific basis is given for this estimate and yet it is used to justify the continuing need for studies. This information would better allow the reviewer to determine if, in fact, the studies proposed for 1991 are justified.

Another major area where insufficient information frustrates meaningful comment on the 1991 Plan is the restoration projects. While ESC has consistently maintained that restoration should be the primary focus of the damage assessment process (with a recognition that natural recovery is likely to be in

most instances the cost-effective alternative), it is impossible to provide meaningful comments on the restoration studies other than to note deficiencies obvious from the limited information provided. In its comments to the Draft 1991 Restoration Work Plan, ESC noted that the Restoration Work Plan should contain, among other things, sufficient information to justify the cost effectiveness of the proposed restoration projects. This included the costs and expected results of alternative restoration projects, including natural recovery. The 1991 Plan fails to contain rudimentary information such as the nature, extent, and location of the injured resources, let alone information on restoration alternatives. Without this information, no one can properly evaluate the proposed restoration activities.

The mere fact that the 1991 Plan is published in advance of the 1991 studies does not mean that the public or the PRPs have had adequate opportunity to comment. As noted in the above examples, and in ESC's comments to the 1989 and 1990 Plans, the Plan must incorporate the results from the prior years' studies as well as adequate information on the proposed studies in order to provide the reviewer with a full and complete opportunity to comment. The 1991 Plan fails on both counts.

The 1991 Plan adds new damage claims which are clearly not compensable as natural resource damages.

As ESC noted in its comments on the 1990 Plan, the Trustee Council has expanded the scope of the damage assessment process beyond determining the reasonable costs of necessary restoration work (e.g. archeological studies). Two projects proposed in the 1991 Plan vividly illustrate a continuation of this trend. They are the Oil Spill Public Information Support Project and Economic Study No. 10--Petroleum Products Price Impacts. Neither of these projects are related to assessing injury to natural resources or calculating compensable damages.

The Oil Spill Public Information Support Project provides funding for the operation of the Oil Spill Public Information Center (OSPIC). The Plan states

that "the OSPIC serves the public by providing access to information about oil spills in general and the Exxon Valdez spill in particular." The Plan also states that an objective of this project is to "answer Freedom of Information Act requests from the public about the EVOS (p. 275)." This activity has nothing to do with the assessment of damages to natural resources and cannot be justified as part of the assessment. Furthermore, responding to the Freedom of Information Act requests is a required government function. Its cost is not recoverable within the context of a natural resource damage assessment. ESC would also note that many of the Freedom of Information Act requests have been caused by the Trustee Council's refusal to voluntarily provide information on their activities.

Economic Study No. 10--Petroleum Products Price Impacts--states that if there is a connection between the EVOS and the observed petroleum market price increases, damage to consumers of petroleum products will be estimated. The apparent basis of this study is that somehow the Exxon Valdez oil spill caused the retail price of gasoline on the West Coast of the United States to increase. Assuming for argument that this was the case, this study fails to explain how such damages constitute natural resource damages as opposed to private damage claims by the consumers who allegedly paid the higher gasoline prices. Even more fundamentally, the study fails to explain or give any basis for how such damages flow from injury to any natural resource.

<u>The 1991 Plan will not lead to a calculation of damages that can be supported under the Clean Water Act or the DOI regulations.</u>

The 1991 Plan fails to correct the numerous deficiencies and errors noted in ESC's comments on the 1989 and 1990 Plans. Consequently, the 1991 Plan will not determine what, if any, cost-effective restoration activities including natural recovery are required to restore natural resources injured by the oil spill. The 1991 Plan will result in the double counting of natural resource damages as well as inclusion of the inappropriate claims. The 1991 Plan continues to fail to provide adequate information to justify the proposed activities. The Trustee Council's actions in the 1991 Plan have fundamentally

departed from both the substance and procedures required by the Clean Water Act and the DOI regulations.

A P P E N D I X

COMMENTS ON INDIVIDUAL STUDIES

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INTRODUCTION

This Appendix contains summary comments for each of the technical areas: Marine Mammals, Coastal Habitat, Fish/Shellfish, Terrestrial Mammals, Birds, Technical Services, and Archeology. Immediately following each area summary are comments on each technical study within that area which provide additional observations about the proposed studies.

Comments on the studies in the Restoration and Economic areas are also included in the Appendix.

The individual study comments are generally similar in format and address study objectives and methods. The set of study descriptions provided in the Plan cover a variety of topics, contain varying levels of details, and reflect the efforts of a number of investigators. Accordingly, the responses in this Appendix focus on individual study objectives where it is believed appropriate. In other cases, broader comments are provided to more suitably encompass and discuss study objectives.

In ESC's comments on the 1989 Draft Plan and 1990 Plan, extensive regulatory exceptions were noted for each individual study. Although not specifically enumerated in the following study comments, those same exceptions apply in general to the 1991 studies.

APPENDIX - SECTION A

DETAILED COMMENTS ON

MARINE MAMMAL STUDIES

A. COMMENTS ON MARINE MAMMAL INJURY ASSESSMENT

The 1991 Plan proposes three studies to evaluate injury to marine mammals, costing approximately $1,091,000. One study (MM2) focuses on field observations of killer whales ($186,000). Another study (MM5) focuses on harbor seal reproduction ($94,200). The remaining study (MM6) evaluates impacts on sea otters ($811,000). This last study is divided into 8 separate components, MM6A-MM6H. The costs of MM6A are included in the budget for Bird Study Number 2. In comparison to 1990, the 1991 Plan has deleted investigations of humpback whales and sea lions, and necropsy of cetaceans. The study of rehabilitated sea otters has been incorporated into MM6.

The 1991 Plan fails to properly reflect the fact that evidence of injury to some resources (e.g. whales) has not been substantiated and other resources (e.g. sea otters) impacted by the spill are already experiencing rapid recovery, even in previously oiled areas.

Studies continue to ignore obvious indicators of natural recovery and overall ecological health.

None of the proposed marine mammal studies address the obvious indications that natural recovery is already well underway and that wildlife is thriving. Hence, they do not represent a sound, balanced approach in which both sides of the issue (injury and recovery) can be fairly assessed. This is especially true for sea otters (MM6), where observations in 1990 were very encouraging. Drs. T. M. Williams and R. W. Davis, who organized the otter rehabilitation effort following EVOS, visited PWS in 1990 to gauge the recovery of the otters in impacted areas. They noted[1] that "Large numbers of adults and pups were found in previously oiled areas, and they appear to feed and behave normally. These results suggest that many of the previously contaminated areas are able to support sea otters." This finding was consistent with that of Drs. Baker, Clark and Kingston[2] who observed that "Sea otters are abundant in Prince William Sound. With a potential for the population to grow at nearly 20% per year, we have concluded that whatever losses were suffered in the oil spill are likely to be rapidly made good by natural reproduction."

The ability of the sea otter population to sustain the initial impact from EVOS without any significant long-term population effect is also directly related to the size of the population of the spill-affected area. A. R. DeGange, in a U.S. Fish and Wildlife symposium in April 1990, indicated that more than 16,000 sea otters inhabited the portions of PWS and GOA impacted by the oil spill.

In view of this large "population reservoir" and the already abundant indications of natural recovery, study MM6 is unwarranted.

Studies exhibit an absence of restoration focus.

The studies on killer whales (MM2), harbor seals (MM5), and sea otters (MM6) are exclusively focused on examination of EVOS effects on populations. No attempt has been made to investigate and define restoration options and methodologies. No information is provided to indicate how the findings of these studies can lead to the identification of meaningful restoration projects. This conflicts with the statutory and regulatory basis for the work.

Natural variability, confounding environmental variables, and alternative hypotheses are not adequately considered in the study design.

Pre-spill baseline data in the form of population trends and spatial or temporal variances are largely unavailable for the parameters of interest in the marine mammal studies. This will severely limit the Trustee Council's ability to detect post-spill differences and to determine whether differences are due to EVOS or natural biological variability in the population.

A particularly striking example relates to populations of harbor seals (MM5) which have been declining for unknown reasons over the last several decades. The planned study designs will not allow a separation of the effects of the oil spill from numerous natural factors which have been shaping population trends over the last twenty years.

In addition, the design and application of statistical models for testing of effects are vaguely defined and it is not clear how EVOS effects are to be estimated in many of the studies.

Studies fail to establish a pathway for exposure.

Continuing exposure to biologically meaningful concentrations of oil for many of the studies is doubtful. In view of the rapid return to background levels of hydrocarbons in the waters of PWS and the GOA[3] and the lack of evidence of substantive contamination of fish or other food species[4] it is doubtful that a continuing exposure pathway to EVOS hydrocarbons can be established. (MM6F and MM6G)

Studies are not cost effective.

The costs of the studies are unwarranted in light of the unlikely population impacts attributable to EVOS on species such as killer whales (MM2). The database management system (MM6H) is clearly outside of the scope of NRDA, and in fact duplicates funding for concurrent studies. (MM6A, MM6B, MM6C, MM6E, MM6F, MM6G)

Studies are predominately research oriented.

Each of the marine mammal studies contains significant components that rely heavily on untested, nonstandard, or novel methods (i.e. research) to detect potential injury. This reliance will undoubtedly result in costly trial and error methods development as well as poorly supported conclusions that attempt to relate low level hydrocarbon exposures with any observed biological effects.

References

1. Williams, T.M. (Research Physiologist, Naval Ocean Systems Center). "Evaluating the long Term Effects of Crude Oil Exposure in Sea Otters:

Laboratory and Field Observations." Presented at a special symposium, "The Effects of Oil on Wildlife," held in conjunction with the 13th Annual Conference of the International Wildlife Rehabilitation Council, October 17-18, 1990, Herndon, Virginia; 13 pp.

2. Baker, J.M. (Independent consultant, former Director of U.K. Field Studies Council); Clark, R.B. (Prof. Emeritus of Zoology, University of Newcastle Upon Tyne); Kingston, P.F. (Asst. Director of U.K. Institute of Offshore Engineering). "Two Years after the Spill: Environmental Recovery in Prince William Sound and the Gulf of Alaska." Presented at American Association of Petroleum Geologists Convention; 31 pp.; Dallas, TX, April 7-10, 1991.

3. Neff, J.M. (Senior Consultant, A.D. Little). "Water Quality in Prince William Sound and the Gulf of Alaska." Cambridge, Massachusetts: Arthur D. Little; 37 pp.; March 1991.

4. U.S. Food and Drug Administration. "Report of the Quantitative Risk Assessment Committee: Estimation of Risk Associated with Consumption of Oil-Contaminated Fish and Shellfish by Alaskan Subsistence Fishermen Using a Benzo[a]pyrene Equivalency Approach." Advisory Opinion on the Safety of Aromatic Hydrocarbon Residues Found in Subsistence Foods that were Affected by the Exxon Valdez Oil Spill. Submitted to the Alaska Oil Spill Task Force by the U. S. Food and Drug Administration, Center for Food Safety and Applied Nutrition, Washington, D.C.; August 9, 1990.

Study Title: **ASSESSMENT OF INJURIES TO KILLER WHALES IN PWS**

Study Number: **MARINE MAMMAL STUDY NUMBER 2** **Study Cost**: **$186,000**

This study attempts to measure potential oil related effects on killer whale populations by measuring seasonal distribution, abundance, natality, and mortality. Methods to be used include visual observations from small boats deployed from shore-based camps as well as aircraft sightings. Photographic identification of individual whales will attempt to relate to the historical photo database. The study description is virtually identical to the 1990 Plan with the following exceptions: the study is restricted to PWS in 1991, field activities start in May (versus June for 1990), the 1991 Plan describes NOAA's role, photographic techniques and film labelling are described in detail, and safety issues are addressed.

Study Objective(s)

Objectives A-E. This study considers existing information, but it is unlikely to achieve its objectives in any quantifiable scientific sense. The normal distribution pattern for this species in PWS has not been sufficiently established. Therefore, historical killer whale movements and population dynamics are too poorly understood to allow for meaningful comparisons with post-spill data. Further, there has never been a documented case of whale mortality due to contact with oil. Consequently, there is no known pathway for oil to be harmful to whales, especially two-years after the spill. Therefore, it is impossible to attribute whale mortality to oil exposure, especially when factors associated with fishery interaction and natural mortality are ignored.

It is also biologically nonsensical to attribute whale distribution and behavior to oil exposure without first considering food source distribution and other biologically critical factors.

Objective B. It is impossible to evaluate the study plan without clear definition of "adjacent waters." Since killer whales regularly move in and out of PWS and "adjacent" waters, it is impossible to define "similar to that reported for prior years" in any quantifiable sense.

Objective C. Pod structure and integrity are not defined; therefore a test of the hypothesis that these parameters remain constant is not valid. It is also impossible to relate accepting or rejecting this hypothesis, if it could be tested, to the spill two years later.

Objectives D, E. There is no literature relating to killer whale natality or mortality to oil exposure. Since these factors will vary naturally it is nonsensical to relate differences to previous oil exposure, if it occurred, particularly since other environmental factors are not considered.

Field Methods

The Plan provides inadequate detail with regard to study methodology, sampling locations, survey design and data compilation to allow a proper technical review. These shortcomings are exemplified but not limited to the following:

- Sampling locations are described only as areas "known for whale concentrations."

- Besides photographs, it is not indicated what other data (e.g. sex, age or activity data) will be gathered on the survey form.

- There is insufficient detail to determine whether sampling methods are adequate for statistical analysis.

- The quantification of search effort is not described, therefore comparisons of abundance and distribution between years may be invalid.

- The disturbance and harassment caused by the field activities required to obtain photographs may bias results.

Analytical Methods

Analytical methods are not well described so it is impossible to determine if scientifically valid conclusions can be drawn from the data. There is no definition of "pod structure and integrity," or a description of how abundance and distributional data will be analyzed. The types and number of statistical analyses are not described. Methods for determining mortality and natality rates are not provided.

Objectives A, B, and D seem to depend on the probabilities of whale sightings being constant over the survey route. In reality, these probabilities are usually highly variable, being dependent on various environmental factors such as local prey densities, bathymetry, etc. This problem will be compounded by the addition of the sighting network.

Injury Determination Methodology

Given the limited description, it is unclear how this study will be able to assess killer whale abundance, distribution and reproductive performance in PWS. Further, it is highly unlikely that the results of this study could be used to demonstrate any measurable impact on killer whales related to the spill for at least three reasons.

First, the Plan implies that any change from pre-spill conditions represents damage from the oil spill. In fact, a considerable number of factors other than the spill could be responsible for any observed changes. No apparent effort is being made to examine the impacts of non-oil environmental factors or fishery conflicts on killer whales. This study fails to establish an exposure pathway that links any changes in population distribution and abundance of killer whales to EVOS. Restoration options and methodology are not addressed.

Second, the study indicates that the investigators will conclude whales are absent if they cannot be located in PWS. This assumes that individual killer whales could only be in this area. Absence will ultimately be interpreted as mortality. These are clearly indefensible assumptions with respect to a highly mobile species.

Third, since baseline data are insufficient, the reported injuries will not have a basis. The pre-spill natality and mortality data are insufficient to allow "accurate, precise, complete, or representative comparisons" as required by NRDA regulations. Similarly, insufficient data exist to allow meaningful definition of "normal" killer whale distribution patterns for comparison to post-spill data.

Lack of Restoration Focus

This Study is not compensable under DOI regulations. It does not address either the identification or selection of restoration options. Further, this study is purely a research effort and is neither appropriate, necessary or sufficient to assess damages for killer whale populations.

Study Title: **ASSESSMENT OF INJURY TO HARBOR SEALS IN PWS, GOA, AND ADJACENT AREAS**

Study Number: **MARINE MAMMAL STUDY NUMBER 5** **Study Cost**: **$94,200**

This study attempts to evaluate possible injury to harbor seal populations in Prince William Sound and adjacent areas by measuring distribution, abundance, pupping rates with associated histopathology, and tissue analyses. Boat and aerial surveys will be conducted at 25 haulouts in oiled and unoiled areas. The study description is virtually identical to the 1990 Plan with several minor exceptions: the introductory material is abbreviated, GOA is added to the title, and the lead and cooperating agencies (NOAA and ADF&G) have switched. Most notably, the intentional killing of apparently healthy individuals in order to obtain pathologic and toxicologic data has been deleted from the 1991 Plan, presumably because this activity was completed during 1990. A total of 28 animals have been killed intentionally.

Study Objective(s)

Objectives A-B. While the study design does consider use of available information, the objectives will be impossible to achieve through the methods described. To date, no clear cause and effect relationship has been established between petroleum hydrocarbon exposure, tissue burdens, and pathologic effects. Consequently, cause of death will be impossible to establish, because the link between tissue petroleum residues and pathological conditions does not exist.

Objectives C-D. Differences between oiled and unoiled areas may be observed, but attributing such differences to oil as opposed to natural variability will not be possible. This study is part of an ongoing research project investigating the cause of the declines in harbor seal populations which have been occurring in the northern GOA for the last several years. Such ongoing research is not compensable under NRDA regulations.

Field Methods

In general, the field methods are inadequately described. Nevertheless, the following observations can be made:

- The field methods will not be able to separate distributional changes from changes in abundance because seal distribution dynamics are poorly understood.

- Although chain-of-custody issues for biological specimens are addressed, QA/QC issues are not addressed.

Analytical Methods

Descriptions of the analytical methods to be used are not sufficiently detailed to allow for proper evaluation of their validity to derive sound, scientific conclusions. No description is provided for the location where "impacted" or "control" seals were taken. If reference seals were taken from Southeast Alaska, they are not a valid reference. These seals are likely to have different genetic characteristics and have different habitat and food supply controlling their health.

The analysis strategy appears to assume that oiling levels two years ago in sample collection locations represent exposure of the collected seals to hydrocarbons in its home range. Further, pathologic findings are assumed to correlate with tissue residue data. These are not valid assumptions. Seals are known to migrate and no link between tissue hydrocarbons and pathologic effects has been established.

For both unoiled and oiled and pre-and post-spill comparisons, it will be impossible to determine if a statistically significant effect was due to oil or other factors such as survey techniques, quality of observers, food supply or inherent differences in habitat.

Statistical procedures are vaguely defined and sample sizes for the exposure/pathology work are inadequate, especially for the reference sampling. It is very unlikely that the effects of the oil spill can be estimated and tested statistically. The level of effect being tested and the effort (i.e., number of samples, replicate subsamples, etc.) needed to detect that effect are not given. The sampling effort is not appropriate to meet objectives. The probability of declaring an effect when there really is not one (Type I error) is not given. The probability of failing to find an effect when there really is one (Type II error) is not given.

Types of tissues collected, methods for toxicological analyses, and techniques for fingerprinting of hydrocarbons (i.e. specificity to Valdez fingerprint) are not described.

Injury Determination Methodolgy

The 40% decline in abundance which was observed in the trend counts was only based on two-years of data. This is insufficient for establishing any meaningful baseline, trend, or natural variation. Since the cause of the decline is not known, any impact of the oil spill on harbor seals is unlikely to be detected by this study.

This study fails to document an exposure pathway of EVOS to the seals. This is necessary for the "assessment of how hydrocarbons were assimilated by seals and how contaminant levels changed with time" to be related to the spill.

Lack of Restoration Focus

The harbor seal study is part of a long-term research/management project and lacks any restoration focus. The Plan fails to indicate how injury assessment will lead to selection and implementation of restoration options.

Study Title: **BOAT SURVEYS TO DETERMINE SEA OTTER ABUNDANCE IN PWS FOLLOWING THE EVOS**

Study Number: **MARINE MAMMAL STUDY NUMBER 6A** **Study Cost:** **INCLUDED IN BIRD STUDY #2**

This study will attempt to assess the impacts of the oil spill on sea otter populations through surveys of wild populations living in both oiled and unoiled areas, and is a continuation from the 1990 Plan. Methods include boat based surveys of both shoreline and offshore transects. Abundance will be estimated for shoreline, coastal, and pelagic environments.

Study Objective(s)

Objective A. This does not consider factors other than oil that may cause differences in otter densities between oiled and unoiled areas. Prior to EVOS, eastern PWS (an unoiled area) supported higher otter densities than western PWS because of higher quality habitat. Thus, these are not valid control areas.

Objective B. Similarly, for Objective B, any differences between years are automatically attributed to oil, even though many other factors could cause differences. Objective B assumes that in the absence of oil, otter populations in PWS are stable. This assumption is clearly incorrect.

Objective C. In regard to Objective C, any difference between pre- and post-spill otter populations could be due to variation in distribution rather than abundance.

Objective D. The estimate of the post-spill population size of otters in PWS (Objective D) will be more of an index (qualitative) rather than a complete count (quantitative) because of inherent problems in censusing otter populations.

Objective E. Using otter densities during the winter of 1991 to estimate densities during March of 1989 (Objective E) is invalid because otter populations in PWS are not constant from year to year.

Field Methods

The sampling locations and site selection criteria are inadequately described. Methods of stratification of transects by presence or absence of oil are not clear. Time of day when surveys are to be conducted is not indicated. Pre- and post-spill densities of otters may not be compared because methods and transects vary among 1984, 1985, 1990, and 1991. The survey techniques, transect location, and number of transects are different every year, and will confound any interpretation. An exposure pathway that may link any changes in distribution and abundance in 1991 to EVOS is not documented.

Analytical methods

This study does not incorporate or follow the conventional scientific method; no testable hypotheses are stated. It is scientifically unreasonable to conduct a scientific experiment without well defined hypotheses. This violates the NRDA requirements that study plans must "have well defined and accepted criteria for accepting and rejecting results." Statistical assumptions pertinent to the analyses are not given and have not been outlined in previous Plans. Significance levels are not stated a priori. Comparing third year post-spill surveys to pre-spill estimates will not determine injury to populations. The sentence "Differences in otter densities ...dependent upon post-stratification of oil condition" requires clarification. Lastly, analyses are inadequately described for substantive review.

Lack of Restoration Focus

There is no discussion of methodology nor implementation procedures for restoration purposes as required in the NRDA regulations.

Study Title: **INTERSECTION MODEL OF SEA OTTER MORTALITY**

Study Number: **MARINE MAMMAL STUDY NUMBER 6B** **Study Cost:** **$70,000**

This new study in 1991 attempts to develop analytical models which relate oil exposure of sea otters to subsequent mortality along Kenai Peninsula, apparently to provide an estimate of total mortality. The study involves estimating the following parameters: abundance of sea otters at time of spill, level of exposure at various locations, degree of oiling of otters at specific exposure level, and mortality rate associated with each degree of oiling.

Study Objective(s)

The model is neither a standard nor a widely accepted technique (as required by NRDA regulations) for estimating mortality of marine mammals. Further, this study purports to estimate otter mortality. It is unreasonable to believe that any mathematical models which relies on such uncertain data and invalid assumptions, can provide any useful information for damage assessment. Thus, this model is counter to NRDA Regulations.

Field Methods

The proposed model misuses the NOAA model of oil movement. The NOAA On-scene-spill-model was only developed for immediate response, and is not sufficiently sensitive for long-term modeling of oil trajectories. It isn't designed to characterize localized current, tides, wind-patterns, and other site-specific physical and oceanographic phenomena. The NOAA model would need significant modification and testing to be appropriate for this application.

The exposure region for each otter or group of otters is too large. For example, California otter movement patterns are used to estimate PWS otter movement regions. There is no basis for this assumption given the different food base distribution/abundance and colony size in Alaska. Also, the Plan

assumes that the whole otter region is classified as an "exposed" area even if only a small fraction of the region was ever oiled. This results in extremely overstated numbers of animals potentially exposed.

The measure of exposure of a location to oil (gallons*days/km^2) does not allow for the changing physical characteristics of oil from a continuous slick to windrows to localized mousse.

Considering all mortality in the rehabilitation centers to be spill-related if it occurred within 30 days of capture is unreasonable. All otters that died, did so within 34 days. Some were unoiled and deaths were clearly not spill related. This invalid assumption will overestimate rates of mortality due to oil. Given that 28 unoiled otters died in the rescue centers[1], it is clear that factors other than oil contributed to deaths.

The two study areas (one heavily and one lightly oiled) do not account for the entire range of oiling levels and weathering within PWS. Therefore the model will lack precision in mortality estimates. Failure to account for other effects invalidates the estimates of mortality.

The methodology of relating degree of oiling to exposure is not adequately described. This study fails to account for significant changes in physical and chemical properties of oil exposure with time and between areas. The degree of oiling categories are subjective and cut-off points for classification of captured otters based on quantity-of-oil on pelage are arbitrary. Because these classifications are not based on pathological factors, associated mortality rates are mere guesses.

The sentence "Values defining high ..., moderate ..., and low exposure will be defined" requires clarification. Justification for this classification scheme is lacking, and it appears that data will be modified until they fit the preconceived model output.

Analytical Methods

Conventional scientific methods are not followed. No testable hypotheses or significance levels are stated. Any point estimate of sea otter mortality must be placed within bounds of a confidence interval. There will be major problems developing a single point estimate based on numerous categorical input parameters, therefore the model will lack precision and will be extremely coarse in estimation of mortality. The ability to estimate confidence intervals is apparently missing.

The pathway through which all the otters have been exposed to EVOS, has not been adequately demonstrated. The model does not consider weathering of the oil. Oil was at sea for 4 weeks prior to arrival in Kodiak. The weathered oil is much less toxic to otters than fresh oil. Because the model neglects oil weathering, it will overestimate mortality.

Lack of Restoration Focus

This study does not address evaluation and identification of restoration options, therefore it does not follow NRDA regulations.

References

1. Williams, T.M.; Davis, R.W. "Sea Otter Rehabilitation Program, 1989 Exxon Valdez Oil Spill": Internatinal Wildlife Research, July 1990.

Study Title: RADIOTELEMETRY STUDIES ON SEA OTTERS IN PWS

Study Number: MARINE MAMMAL STUDY NUMBER 6C **Study Cost: $350,000**

The goal of this study is to compare the survival, reproduction, and behavior of wild sea otters not treated following the EVOS with those treated and released from rehabilitation centers. Pre-spill/post-spill and oiled/unoiled comparison will also be conducted to assess effects on otter population in PWS.

Methods of this study continued from 1990 include radio transmitter implantation, tracking, and monitoring of sea otters.

Study Objective(s)

The study is inadequately described, and objectives cannot be achieved. The objectives ignore the fact that translocation of the otters will likely play a larger role in otter survival than will oil exposure. Several studies have shown that translocation can have a large impact on otter movements and survival. All the objectives will be compromised by the bias introduced by using a higher quality habitat (Eastern PWS) as a control for comparison.

Objective A (Weanlings) and Objectives A-C (Females). These objectives cannot be achieved because: 1) there is no reliable baseline survival or age structure data available for PWS, and 2) sample sizes will be far too small to assess survival at various age classes.

Objective B (Weanlings) and Objective D (Females). Documentation of movement in 1991 with respect to areas affected by oil in 1989 is not testable. This study assumes any differences in movement are attributable exclusively to oil and not year effects.

Objective A-C (Otters from Rehabilitation Centers). Comparisons of otter survival, reproduction, and movement between eastern (assumed unoiled) and western (assumed oiled) PWS is not valid because of pre-spill differences in habitat quality.

Field Methods

Field methods are inadequately described. The frequency of relocation of instrumented otters is not given. It is unclear how adult females will be distinguished from males during counts of the study populations. Methodology for classification of oiled and unoiled areas is not described. Eastern PWS (assumed unoiled) was a higher quality otter habitat than western PWS (assumed oiled) prior to EVOS. Therefore comparisons of reproductive parameters between eastern and western PWS after EVOS will be confounded by historical habitat quality differences.

Analytical Methods

Methods are insufficiently detailed. Sample sizes may be too small to allow for meaningful analysis and development of sound conclusions. A total of 45 rehabilitated otters with such diverse characteristics (i.e., collection site, sex, level of oiling, time of exposure, nature of exposure, etc.) is too small to detect differences that could be extrapolated to the rehabilitated otter populations. Pre-spill habitat quality differences between eastern and western PWS will confound any post-spill comparisons of these areas. Analysis is further confounded by natural environmental variables following EVOS.

Simply assuming that sea otters captured in treated areas have been exposed either directly or indirectly to EVOS is not valid. Further assuming that otters from unoiled portions of PWS (Eastern PWS) are healthy and provide a valid reference is inappropriate due to differences in habitat quality.

Study objectives are compromised by the fact that otters were captured, maintained in captivity, stressed and translocated. Oil exposure is only one

of a number of significant factors potentially impacting the otters. In fact, several of the animals were judged to be unoiled by otter center workers when they were admitted to the rehabilitation facilities. Conclusions from this study will most likely pertain to effects of captivity and translocation of sea otters.

These studies will not "gauge what is normal for this population" because sampling design is inadequate and will be confounded by unstudied (habitat quality) variables. Therefore, they will not establish either "a measure " or a "goal for recovery efforts."

There is no documentation of current exposure pathway to EVOS for all rehabilitated or untreated sea otters. There is no discussion of how this information will be utilized in the selection/implementation of EVOS rehabilitation.

Study Title: SEA OTTER PREY SELECTION AND FORAGING SUCCESS IN WESTERN PWS

Study Number: MARINE MAMMAL STUDY NUMBER 6D **Study Cost: $70,200**

This study, initiated in 1991, attempts to describe the species composition and relative frequency of occurrence of prey selected by sea otters in three locations in western PWS following EVOS. In addition, exposure rates of sea otters to dietary hydrocarbons may be studied.

Study Objectives

Descriptions, collections, and estimations are not objectives of scientific studies with testable hypotheses. Neither baseline nor comparative data are available for testing hypotheses of spill effects.

Field Methods

No methods are described that will separate spill effects on foraging ecology from the effects of observer quality, natural variability in prey abundance and type, and differences in study areas.

Methodology and sampling protocols are vague and generalized. Determining sampling protocols "as necessary" for identified prey is not a protocol. Sample sizes and replication are not discussed.

Site selections do not include designated control sites. No pre-spill data are available for Knight Island. No control over confounding variables is shown such as changes in prey populations not related to EVOS. Background variation in prey availability among study sites is high.

Strategy for listing prey "by species" is not given, and is probably impossible if done with binoculars.

Analytical Methods

The conventional scientific method is not followed; no hypotheses are described, and statistical techniques are inadequately defined and described. Descriptions of toxicological analyses of prey item tissue are inadequate. Types of compounds to be analyzed are not stated.

Statements such as "analyses, as appropriate, will be used to detect differences" is outside the normal hypothesis testing procedures and accepted scientific standards.

Lack of Restoration Focus

This study will not quantify injury to sea otter populations in PWS. Restoration methodology and options are not discussed; consequently, the need for this study to establish restoration is unjustified and the study is not compensable.

Study Title: SEA OTTER MORTALITY IN PWS FOLLOWING THE EXXON VALDEZ OIL SPILL

Study Number: MARINE MAMMAL STUDY 6E **Study Cost: $39,800**

In this study, continued from 1990, beach surveys will be conducted in three areas of PWS and sea otter carcasses will be collected. This study attempts to determine if post-spill mortality patterns (age class and sex distributions, and carcass deposition rates) are similar to pre-spill patterns.

Study Objective

The objectives will not assess spill impacts and are largely not achievable with the design and analyses described. There is no reference to the magnitude of the physical and ecological differences between impacted and non-impacted areas.

Objectives A and B. The relative number of deaths of prime age and female otters may be due to a myriad of natural mortality factors including disease and meterological conditions. Adequate baseline data do not exist for definitive comparison purposes. "Reliable baseline age-structure data are not available for the population being assessed" as required by NRDA regulations.

Objectives B and C. The relative number of female otter deaths and total number of carcasses recovered are influenced by many confounding variables. These objectives fail to consider immigration/emigration patterns, factors important in natural mortality, search effort, date of search, and wind and tide conditions.

Field Methods

The control areas are not well described. No information is given which indicates that control areas are comparable to oiled test sites based upon historical data. Criteria for selecting impact and control areas were not

given. Methods will not distinguish between population distribution and population abundance effects.

There is no indication that the study can account for confounding natural environmental variables which may influence results.

Analytical Methods

Assessing oil spill impact from changes in the age or sex structure of beached carcasses requires a full understanding of trends and variation in the population and subpopulation dynamics. Any differences in number of carcasses observed or age/sex structure in comparison to pre-spill years could be attributable to shifts in distribution, weather, or current patterns. There are no reliable baseline data on age structure of otters in PWS. No pre-spill data on age structure are available for Knight and Naked Island.

How this study will distinguish age/sex structure differences attributable to oil mortality from those due to natural causes is not explained.

Statistical procedures are vaguely defined and therefore the effects of oil will likely not be distinguishable. It is not clear how the effects of the oil spill are to be estimated and tested statistically. The level of effect being tested and the effort (i.e. number of samples, replication) needed to detect an effect was not given. Sample sizes and replication are probably inadequate for valid statistical testing. Analyses assume a stable pre-spill age distribution which is clearly wrong.

Toxicological analyses of tissues are inadequately defined in view of the broad variety of analyses described under Technical Services. Analytical techniques need to be defined. Moreover, hydrocarbon analysis of decaying tissue is a waste of money, since interpretable results will not be generated.

Rates of carcass deposition (and subsequent recovery) are strongly influenced by physical oceanographic phenomena such as current patterns, wind fields,

beach morphology, and tidal and wave activity. There is no indication that these factors can be accounted for in the study design.

Differences in prime age between eastern and western PWS clearly indicate a natural bias in the data between control and oiled areas that can not be accounted for.

Lack of Restoration Focus

This study does not address either the identification or selection of restoration options, as required by NRDA regulations.

Study Title: BIOINDICATORS OF DAMAGE TO SEA OTTERS FROM EXPOSURE TO OIL

Study Number: MARINE MAMMAL STUDY NUMBER 6F **Study Cost: $88,400**

This study, continued from 1990, attempts to assess damage to sea otters by examining blood samples, comparing blood analyses with survival and reproduction, measuring pup growth rates, and evaluating health and development.

Study Objective(s)

Objectives of the study are poorly defined and are not based upon testable hypotheses. Assessment of spill impacts on otter health is generally not achievable with the stated design and analyses.

Objective A. The results of blood sample analyses are clearly dependent on habitat, food availability and diet. Otters from SE Alaska clearly could have habitat factors affecting blood chemistry different from those in PWS. Thus, SE Alaska is not a proper control area.

Objective B. Blood analyses of otters from the rescue centers showed conditions returning to normal in a short time[1]. Continued harassment of these otters is unwarranted and invalidates the results of Study 6C.

Objective C. Measurements of pre-weaning growth rates is unrelated to EVOS. There is insufficient background data for comparison and interpretation. Growth rates are related to a myriad of ecological variables not considered in this study.

Objective D. This is not related to EVOS. This is a research study, perhaps geared to population management. However it has no valid mechanism to relate exposure to EVOS.

Field Methods

This study description lacks sufficient detail to allow a complete technical review of the program. There is no comparable pre-spill hematology data from otters in the study areas. The use of a control (reference) area in southeastern Alaska is not appropriate for establishing reliable baseline values for the PWS otter population due to habitat, diet food supply and sub-population differences. Methods to determine specific locations and degree of oiling for comparative purposes are vague and nondescriptive.

Analytical Methods

Statistical analyses are not adequately described. The study does not follow scientific convention; neither testable hypotheses nor significance levels are stated. Unpublished, undocumented, pre-spill growth-rate data provide only poor comparisons which cannot lead to valid scientific conclusions.

There is no valid linkage of the study plan to EVOS. Comparison of otter baseline data to "mapped data on shorelines and offshore areas affected by oil" are not clearly described. The exposure index is not defined. There is no indication that an exposure pathway can/will be identified which is relevant to samples of blood/urine collected in 1991.

Data Analysis

"Exploratory" comparison of blood results from PWS and SE Alaska is research which is inappropriate within the context of NRDA injury assessment. NRDA regulations clearly require the control area to be comparable to the assessment area. This requirement is not met by SE Alaska.

Lack of Restoration Focus

No information is provided on how results of this study can be utilized to select and implement restoration activities as required by NRDA regulations.

References

1. Williams, T.M.; Davis, R.W. "Sea Otter Rehabilitation Program, 1989 Exxon Valdez Oil Spill": International Wildlife Research, July 1990.

Study Title: **ASSESSMENT OF PATHOLOGICAL PROCESSES AND MECHANISMS OF TOXICITY IN SEA OTTERS THAT DIED FOLLOWING THE EVOS**

Study Number: **MARINE MAMMAL STUDY NUMBER 6G** **Study Cost:** **$61,000**

This new 1991 study attempts to determine the efficacy of medical treatment and rehabilitation for sea otters as a viable method for restoration of the Alaska population. Chronic effects of oil on otters will be evaluated through examination of carcasses. Study objectives duplicate those in MM6D and MM6E, thus this study does not seem justified.

Study Objective(s)

These studies will not assist in identifying restoration options. Necropsy, histopathology, toxicology, foraging behavior and prey contamination issues have already been addressed in Studies MM6D and MM6E. No testable hypotheses are stated.

Objective A. There is no indication of how the efficacy of medical treatment and rehabilitation will be evaluated. A publication is already available containing this information[1]. Clearly this is a waste of money and is not compensable.

Objective B. No exposure pathway exists to justify evaluation of chronic effects of residual oil on otters.

Field Methodology

This study will not address restoration alternatives and is purely a research effort. The type of model used to assess toxic effects and pathological processes is not stated. Descriptions of methods for examination of recovered carcasses of sea otters is too brief for substantive comment. Since necropsies

and pathology studies have already been completed, a new study is clearly not needed.

Methods and techniques of histopathology, toxicology, and hematology studies are not discussed.

There is absolutely no discussion of how date of exposure, duration of exposure, and changing composition of oil will be determined.

Presuming that carcasses recovered in 1991 "may provide valuable clues to the factors involved in the death of these animals" is unreasonable, especially for an event that occurred in 1989.

Analytical Methods

No statistical methods for testing a scientific hypothesis are described. Testing and validation of toxicity modeling effort are not discussed. To "further our understanding of pathology processes" is clearly a basic research topic, and not compensable for NRDA purposes.

Methods for relating pathology to geographic location of carcass are not discussed.

Lack of Restoration Focus

No information is provided on how results of this study can be used to select and implement restoration activities as required by NRDA.

References

1. Williams, T.W.; Davis, R.W. "Sea Otter Rehabilitation Program, 1989 Exxon Valdez Oil Spill, International Wildlife Research, July 1990.

Study Title: SEA OTTER DAMAGE ASSESSMENT STUDIES: DATABASE MANAGEMENT AND DATA ANALYSIS

Study Number: MARINE MAMMAL STUDY NUMBER 6H **Study Cost:** $131,400

This study will support data entry, data editing, and record management, statistical analysis, and write-up for sea otter studies.

Study Objective(s)

The objectives are presumably already addressed in Studies 6A-6G as part of standard collection of scientific data. The cost of this effort is grossly unjustified given the relatively small amounts of data generated in the otter studies. The justification for three full-time scientists for a data set of this size is excessive and deserves clarification. The construction of a database is not under the purview of NRDA regulations and is not compensable.

Field Methods

All field methods are duplications of studies already addressed in Studies 6A-G. It is not apparent why the database system is required. Individual principal investigators should be capable of managing their own data.

Analytical Methods

Methodology for analysis of data is described only in a vague and general manner. No testable hypotheses are stated, nor are significance levels given. All analyses have been discussed in Studies 6A-6G.

APPENDIX - SECTION B

DETAILED COMMENTS ON

TERRESTRIAL MAMMAL STUDIES

B. COMMENTS ON TERRESTRIAL MAMMAL INJURY ASSESSMENT

The 1991 Plan includes two studies on the assessment of injury to terrestrial mammals, costing a total of $453,300. One study (TM3) represents a continuing sizeable effort to determine if the EVOS will have a measurable effect on river otter populations in PWS ($377,300). A smaller study (TM4) is looking at possible effects on populations of brown bear on the Alaska Peninsula ($76,000).

Since neither a continuing pathway for exposure to EVOS hydrocarbons nor evidence of significant effects on terrestrial mammal populations has been demonstrated over the past two years, there is no justification for continued studies in 1991. In particular, the shoreline conditions have not been a potential threat to terrestrial mammals since the removal of bulk oil in the summer of 1989. Numerous observations provide evidence of the diminished threat of oiling. Very little oil coverage persisted in 1990[1] and the risk to the biota which might provide a portion of the food base for terrestrial mammals was addressed by NOAA[2] at that time. With respect to the upper intertidal zone, NOAA's 1990 report stated:

> "The upper intertidal zone, generally the location of the highest concentrations of subsurface oil, is normally not inhabited by a very rich biological community because of relative dryness, sediment mobility, and lack of food."

In the middle intertidal region which is somewhat rich in biota, it was contended:

> "To the extent the oil remains buried, it poses no serious risk to intertidal communities in this zone."

Finally, with respect to the lower intertidal, it was observed:

> "The lowermost intertidal zone has the greatest biomass and species diversity. In most cases, this zone is showing evidence of recovery and

> only very low concentrations of oil occur in the surface sediments. The lower intertidal zone would be least impacted by the residual subsurface oil."

The studies continue to ignore obvious indicators of natural recovery and overall ecological health.

For example, NOAA found no evidence of residual oil causing sublethal effects by progressing up the foodchain. Results from NOAA's 1990 Shoreline Monitoring Program[3] noted "Chemical analyses of tissues from selected intertidal organisms indicated accumulation of hydrocarbons from the environment but no evidence of magnification through predator-prey interactions."

Dr. E. H. Owens has monitored recovery of the oiled shorelines since 1989. In spite of focusing on a set of study sites which were biased toward worse-case conditions, Owens[1] found:

> "The combined result of treatment and natural cleaning was that the majority of shorelines retained little or no oil by the end of the summer of 1990... The combined average surface oil cover area of all the Prince William Sound study sites dropped drastically between May 1989, from 46 percent of the total observed area to less than 2 percent by September 1990."

Finally the proposed study on the impact of the spill on brown bears (TM4) appears to disregard the obvious good health of these terrestrial mammals. The continued permitted sport hunting of these animals in the areas impacted by the spill is a clear acknowledgement by the government that the population is healthy and that a harvestable surplus exists.

The studies on river otters (TM3) and brown bear (TM4) do not recognize other factors responsible for change.

Many natural variables, such as severe winters, predator/prey relationships,

and disease, clearly affect key life cycle events of various species. It is highly doubtful that the sampling and methods programs described for these studies will capture the necessary information to demonstrate that a significant portion of the expected biological variability is related to oil contamination rather than to natural factors.

The studies on river otters (TM3) and brown bear (TM4) fail to quantify injury to resources.

As stated in the recent government "Summary of Injuries" no conclusive injury has been documented" for brown bears. In addition, no meaningful evidence of injury to river otters was provided in the government summary.

The studies on river otters (TM3) and brown bear (TM4) fail to establish an obvious pathway for exposure.

As noted above, with the rapid reduction in shoreline oiling conditions it is extremely unlikely that populations of these terrestrial mammals could have been significantly impacted by the EVOS.

In addressing the environmental threat of remaining oil, NOAA[3] stated:

> "The bulk composition of the remaining oil is comprised primarily of the residual or asphaltene fractions which have negligible solubility and little demonstrated toxicity, and thus pose little environmental risk to intertidal and water-column organisms, even if there were routine releases."

The study on river otters (TM3) is not cost effective.

This project was budgeted for $287,700 in 1989, $347,600 in 1990, and $377,300 (proposed) in 1991. The study will only assess short-term impact on otter density, since the otters mature rapidly and have relatively large litters.

This study will certainly violate the regulatory requirement that the assessment costs not exceed the anticipated damage amount determined.

References

1. Owens, E. H. (Senior Consultant, Woodward-Clyde). "Changes in Shoreline Oiling Conditions 1-1/2 Years after the 1989 Prince William Sound Spill." Seattle, Washington: Woodward-Clyde; 116pp.; March, 1991.

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3. National Oceanic and Atmospheric Administration. "Exxon Valdez Shoreline Monitoring Program: 1990 Results" Pentec Environmental, Inc. and Environmental and Energy Service Co. Released April 9, 1991, in Washington, D.C. by NOAA.

Study Title: ASSESSMENT OF THE EFFECT OF THE EVOS ON RIVER OTTERS IN PWS

Study Number: TERRESTRIAL MAMMAL STUDY NUMBER 3 **Study Cost: $377,300**

This study attempts to evaluate possible effects to river otter populations by measuring and comparing distribution, abundance, mortality, and habitat use of river otters. Study methods include surveys at latrine sites, checking food habitats and prey remains, radio tagging and monitoring, necropsies, and histopathology and hydrocarbon analyses on tissues from recovered carcasses.

Study Objective(s)

The study's stated objective to determine if the EVOS had measurable effects on river otter populations cannot be achieved because of the absence of valid pre-spill population data. Comparison of total numbers and survivorship between oiled and unoiled areas over three-years (1989, 1990, and 1991) will not provide an accurate assessment of injury to populations.

This study is certainly not cost effective. An expenditure of $347,000 in 1991 (following $287,700 in 1989 and $347,600 in 1990) to evaluate possible effects to river otter (and mink) populations, when few, if any, fatalities have been observed, is unwarranted. In addition, there will be a quick recovery from any short-term impacts on otter density since otters mature rapidly and have relatively large litters.

This proposed study on river otters is aimed only at determining possible population effects. There are no components which will help define reasonable restoration strategies, if needed, for these animals.

This proposed study will provide ample data for improved population management of river otters, involving habitat use and movement patterns. However, it falls short of measuring any population impacts relating to the EVOS. Thus, it is not compensable.

Field Methods

Detail on study locations is not sufficient to permit an adequate evaluation.

Analytical Methods

Detail concerning statistical procedures is not sufficient to allow evaluation of tests. Several statistical procedures used in the study are not adequately referenced.

Criteria for selecting impact and control sites were not given. For that reason, it will be difficult to determine if a statistically significant effect was due to the EVOS or to natural variation.

Injury Determination Methodology

It is inappropriate to compare an impacted site to a reference site for density comparisons when neither site has any valid pre-spill data on population trends or variance. Monitoring the two areas, oiled and unoiled, for only three years will not provide meaningful assessment of any possible injury to river otter populations.

Study Title: ASSESSMENT OF EVOS ON BROWN BEAR POPULATIONS ON THE AP

Study Number: TERRESTRIAL MAMMAL STUDY NUMBER 4 **Study Cost: $76,000**

This study attempts to evaluate possible effects on brown bear populations by comparing survival of female brown bear in oiled versus unoiled areas and by determining cause of death of dead brown bears located during monitoring flights in the oiled areas.

Study Objective(s)

The study objective appears to disregard the obvious good health of brown bear populations, as confirmed by the continued permitted hunting of these animals in the areas impacted by the spill. A significant injury to brown bear would certainly have affected the huntable surplus of this species.

The proposed study on brown bear is aimed primarily at determining possible population effects. There are no components in the study which will help define restoration strategies, if needed, for brown bear.

Although this study is being continued for a third year, there is no discussion of documented mortalities of brown bear in the 1991 Plan. It is extremely unlikely that the population of brown bear could have been noticeably impacted by the EVOS.

As with study descriptions in previous Plans, the proposed 1991 study on brown bear is inadequately detailed to make a complete scientific evaluation. The omission of any results from 1989 and 1990 studies makes it difficult to understand the justification for its continuation into 1991. Recognizing the lack of mortalities, quantitative and unequivocal indications of injury are necessary in order to justify these studies.

The study on brown bear will probably provide data for improved population management of these terrestrial mammals, but is of little relevance to EVOS-related effects.

Field Methods

Sufficient detail containing study locations in the Katmai National Park and near Black Lake was not provided. As a result, no substantive evaluation of the study could be made.

Analytical Methods

Brown bears rapidly metabolize petroleum hydrocarbons. It is extremely doubtful if tissue analyses of dead bear will find hydrocarbons traceable to EVOS remaining in the tissue.

Population density estimates for only two years, 1989 and 1990, cannot be used to predict any trend or identify any impact from EVOS on brown bear populations on the Alaskan Peninsula.

Injury Determination Methodology

The spill area site in the Katmai National Park is not a good choice for determining injury to brown bear from the EVOS. The bear population age structure, particularly for old males, would be quite different in Katmai because the bears are protected, not hunted. This contrasts with the control areas where hunting is permitted. It will be quite difficult, if not impossible, to isolate this age structure variable from any effects of the EVOS on bear populations.

APPENDIX - SECTION C

DETAILED COMMENTS ON

BIRD STUDIES

C. COMMENTS ON BIRD INJURY ASSESSMENT

The 1991 Plan includes five bird injury assessment studies costing a total of $1,497,000. Of the five projects, one represents a large survey effort designed to examine breeding colonies ($530,000). Three others are directed primarily towards measuring a change in population status, specifically a survey of seabirds in general ($220,000), a bald eagle study ($255,000), and a hydrocarbon intake study for sea ducks ($179,000). The final study, a bird carcass re-examination ($313,000), represents an effort to make bird carcasses available to museums and universities for scientific research and education unrelated to the spill damage assessment.

The continuing studies have shown few modifications in response to reviewers' comments. In general, they fail to quantify injury to birds because of inadequate sampling design, lack of pre-spill data, use of inappropriate control sites, and absence of a continuing exposure pathway.

The Trustee Council continues to expend considerable sums of money on studies of bird injuries without describing how those studies will be applied to defining restoration programs. The strongest condemnation of the Trustee Council's efforts is the ample evidence from the literature[1,2] that restoration programs will not be needed.

Historical record contradicts need for bird restoration program.

While the spill caused initial mortality of seabirds, the populations remain abundant. Moreover, the spill mortalities are well within the range of impacts frequently sustained by seabird populations due to natural events and chronic pollution without apparent long-term detriment. Drs. Baker, Clark, and Kingston[1] note:

> "Seabirds are among the most conspicuous casualties of oil slicks and, as such, attract considerable public attention. But there is no reason to suppose that, from a biological point of view, this mortality is damaging

to seabird populations. Arctic and sub-Arctic seabirds also suffer heavy mortality from natural causes and from fishery practices. Even the auks (family including murres), which because of their very low reproductive rate might be expected not to be able to make good these losses, have sustained their population; and there is no evidence that other seabirds with a greater reproductive potential have declined in numbers."

Plan ignores obvious indicators of natural recovery and overall ecological health.

The historical record of rapid natural recovery is borne out by similar evidence following the EVOS. For example, the 1990 USF&WS operations-related active nest survey data confirmed that the eagle population has successfully re-colonized spill-impacted areas. In addition, M. J. Gibson and J. White, who worked on eagle and bird rehabilitation in 1989 and visited PWS in 1990 reported[2] "accumulating evidence indicates the area's eagle population is also generally healthy and thriving." Moreover, "We observed numerous eaglets and recent fledglings throughout the area. In 1990, many pairs were not only occupying previously oiled territories, but they had also nested, laid eggs, incubated, and hatched chicks that had developed normally."

The continued permitted waterfowl hunting in the areas impacted by the spill is a clear acknowledgement by the government that the population is healthy and that a harvestable surplus exists.

Lastly, the near record fish harvests over the last two-years illustrates the ample food supply for these birds.

This biased approach to scientific inquiry, in which all positive indicators are systematically excluded from consideration, is a clear violation of the scientific method.

Studies fail to establish a pathway for exposure.

The pathway for continuing exposure of EVOS to bird populations is not established or documented. For example, in study B4, blood samples from eagles will be collected and analyzed in 1991 even though samples from this same eagle population showed normal blood characteristics in 1989 following EVOS. (Gibson and White[2], 1990)

In addition, NOAA found no evidence of residual oil causing sublethal effects progressing up the foodchain. Results from their 1990 Shoreline Monitoring Program[3] noted:

> "Chemical analyses of tissues from selected intertidal organisms indicated accumulation of hydrocarbons from the environment but no evidence of magnification through predator-prey interactions."

Natural variability, confounding environmental variables, and alternative hypotheses are not adequately considered in study design.

The studies fail to identify and consider the other variables that could significantly impact the bird populations, such as severe seasonal weather, food supply, disease, and commercial fishing activity, among others. Consequently, there is no way to determine whether any observed change is the result of the spill or of potentially more significant natural environmental factors. Assertions of murre reproduction failure and losses of breeding adults attributable to the spill in the recent government "Summary of Injuries" illustrate the failure of the Trustee Council to consider other possible causes. Mass mortalities of murres with attendant nesting and reproductive impacts are not rare natural events[4,5].

Studies will fail to quantify injury.

None of the planned projects will produce quantitative estimates of injury. For example, the survey projects (B2, B3, and B4), as designed, do not have

either valid pre-spill data or suitable control sites for the assessment of injury from EVOS.

Many of the projects will have difficulty even establishing a reliable level of change for the subject populations. Historical baseline data available for comparison are outdated or extremely limited in many cases, so pre-spill conditions are poorly understood. For example, data from boat surveys in study B3 will be compared to data from the 1970's. Further, little information is available to indicate the levels of natural variation or the amount of data necessary to establish a reliable baseline. Without a valid baseline, no reliable determination of change can be made nor can changes be specifically related to EVOS.

The project descriptions continue to be outlined in a cursory manner.

The descriptions of survey techniques and analyses used in several of the studies (B2, B3, B4, and B11) are not sufficient to evaluate whether stated accuracy objectives could be met. Throughout the studies, sampling approaches (sample locations/sites, numbers of samples/plots, numbers of replicates, etc.) are only defined in general terms. While there is a rudimentary discussion of the application of statistical analyses to the data, such descriptions are usually brief, incomplete, and vague.

Some control sites are invalid.

While the nature of control sites is not disclosed in many cases, some control sites are clearly invalid. In study B3, the Semidi Islands are used as a control site, although they are subject to unique oceanographic conditions which influence food supply and are not representative of the habitat in the affected area. The use of boat and land based surveys provides for different levels of disturbance among colonies; thus, the reliability of making comparisons between the survey methods is questionable.

Studies focus on basic research questions rather than assessing injury.

Study B1 will re-examine and catalogue bird carcasses for future distribution to interested universities and museums. This will not provide any further information relative to injury quantification or identification of meaningful restoration projects, and is therefore not compensable under the DOI regulations. Study B3 will survey populations of nesting seabirds at sites far beyond the spill-impacted area and, hence, has no relevance to establishing baseline populations.

Several aspects of the eagle program (B4) are also research oriented. Population survey, radio-tracking, and productivity survey efforts pursued well outside the oil spill area will not serve NRDA purposes.

References

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2. Gibson, M.J. (Independent Raptor expert); White J. (Doctor of veterinary Medicine, International Bird Rescue Center). "Results of the Eagle Capture, Health Assessment, and Short-term Rehabilitation Program Following the Valdez Oil Spill." Presented at a special symposium, "The Effects of Oil on Wildlife," held in conjunction with the 13th Annual Conference of the International Wildlife Rehabilitation Council, October 17-18, 1990, Herndon, Virginia; 16pp.

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5. Vader, W.; Barrett, R.T.; Erikstad, K.E.; and Strann, K.B. "Differential Responses of Common and Thick-billed Murres to a Crash in the Capelin Stock in the Southern Barents Sea." in "Auks at Sea", S. Sealy, editor. Studies in Avian Biology No. 14, 1990.

Study Title: **FURTHER EXAMINATION OF BIRD CARCASSES FROM EVOS**

Study Number: **BIRD STUDY NUMBER 1** **Study Cost**: **$313,000**

This study attempts to re-examine and re-catalogue bird carcasses for use by museums and universities in scientific research and education. The carcasses are currently being stored in freezer vans. This study is a continuation of the 1990 study assessing damage to seabirds in GOA with mortality models.

This study will not provide any further information relative to injury quantification or identification of meaningful restoration projects, and is therefore not compensable under the DOI regulations.

Study Objective(s)

Objectives A-E. Justification for this study is not substantiated. The 1991 program will generally duplicate previously collected and catalogued information. Estimates of bird mortality should already be completed based on the 1990 modeling effort. The number of birds carcasses requiring further identification is not specified.

Objectives are vague and nondescriptive and no testable or falsifiable hypotheses are stated, therefore, scientific methods are not followed.

Objective A. Re-examining carcasses to refine numbers and indentification to a species level will serve no further use in quantification of injuries.

Objective B. Multiple bird carcasses in a single bag will invalidate the classification of amount and distribution of oil on each bird.

Objective C. The sentence "reorganize the storage system... to allow for quick and easy retrieval" appears to be largely in support of various museums and

universities for use in scientific research. Such activity is clearly outside of the scope of NRDA activities and is not compensable.

Objective D. The sentence "update log sheets with the best available information" is unclear and nondescriptive with no statement of relevance to NRDA.

Objective E. The sentence "gather data that are of value to other bird studies" is vague, and it is not clear that such data have any relevance to NRDA.

Field Methods

The study to reexamine carcasses is unnecessary because most carcasses are already identified by species.

The study description states that "birds will be individually bagged when possible." The proportion having more than one bird in a single bag is not stated. Multiple birds from a single bag will have contaminated each other, thus invalidating the oiling classification resulting in bias of the data.

The description indicates that "in some cases, data on age class and other parameters will be gathered." No indication is given of what protocol may be used to select certain birds for further study, nor specifically what types of additional data may be gathered, nor how the data will be used.

Repeated thawing and refreezing will accelerate decomposition and prevent accurate determination of when the bird died. Moreover, rethawing and rebagging of carcasses will disperse oil over carcasses thus preventing accurate depiction of the proportion and distribution of oil on the plumage, which will result in unrealistic interpretation of oil spill effects.

Analytical Methods

Standardized data sheets mentioned in the description are not provided for comment, therefore interpretation of data may be confounded.

"Report will provide.....complete results of all analyses." Testable hypotheses are not stated and analyses are not described for interpreting as well as rejecting results.

No description is provided for what types of analyses will be performed ("analyses will focus on the number of carcasses, species, and degree of oiling"). Analytical techniques to assess and quantify injury to the resource or to evaluate restoration options are not described.

Lack of Restoration Focus

The cost of this study ($313,000) appears to be far in excess of any value that the study may provide to the NRDA process and its central goal of restoration.

Study Title: **SURVEYS TO DETERMINE DISTRIBUTION AND ABUNDANCE OF MIGRATORY BIRDS IN PWS AND THE NORTHERN GOA**

Study Number: **BIRD STUDY NUMBER 2** **Study Cost:** **$220,000**

This study attempts to evaluate changes in abundance and distribution of migratory birds in Prince William Sound and the northern Gulf of Alaska following EVOS. Data obtained in boat field surveys will be compared to historical data. With the exception that aerial surveys have been discontinued, this study is a continuation of the 1990 study.

Natural variation of migratory bird populations, dissimilar observation techniques, and extrapolation from local surveys to regional populations makes this study futile from a damage assessment perspective. This study is clearly research, and is not compensable under the NRDA regulations.

Study Objective(s)

Objective A. Determination of distribution and estimation of abundance of waterbirds in PWS is a research effort and is exclusive of NRDA injury assessment.

Objective B. A causal relationship between any observed change in seabird relative abundance and the spill will be impossible to establish because of the lack of baseline data and control areas.

Objective C. This objective will be compromised due to the inadequacy of the study design to account for natural variability in waterbird populations.

Field Methods

With regard to boat surveys, the Plan does not indicate whether the level of effort, observer experience, seasonal timing, and other critical factors affecting survey accuracy will match those in earlier surveys. The Plan also does not indicate whether similar protocols will be used for collecting these survey data, thus compromising their ability to make objective comparisons. Shoreline surveys using large 25-foot boats will probably disturb the birds and compromise validity of any observations. Finally, survey location selection methods are not clearly described. Selection method is important to obtain representative data that is accurate and complete.

There is no discussion of count replication or other survey strategies to indicate that a 95% confidence limit would be achieved for the survey data, as stated in the Plan.

It appears that the sampling effort would be inadequate to account for natural variability, perhaps precluding comparisons with historical data.

The description of the sampling design is inadequate. Data from the boat surveys are to be compared to unpublished USF&WS reports, making proper review impossible since the methodologies followed in the earlier studies cannot be adequately compared to those of the proposed studies, nor can the reliability of the older studies be assessed.

The methodology used to identify the "presence or absence of oil" during the boat surveys is not disclosed nor is methodology for linking oil to EVOS. In addition, it is not clear that other variables that can influence bird distributions and abundances are being recorded.

It appears the Trustee Council is combining oiling information from three separate data sets which will result in an internally inconsistent data set.

Analytical Methods

In general, statistical procedures for data comparisons are vaguely defined in the Plan. It is not clear how the effects of the EVOS will be estimated and tested, especially with respect to Objective C, which was to estimate long and short term population trends.

The use of 1970's data as a baseline in the boat survey work is inappropriate since environmental and other unknown changes occurring within the long intervening time period will result in large changes in population status. These environmental effects cannot be separated from the effects of the spill using the available data.

Because pre-oil spill surveys used different transects than post-oil spill surveys (Damage Assessment Surveys), methods are not similar and population estimates cannot be compared. Further, while these studies might estimate changes among years in local density of birds, they will not establish a causal relationship between such a change and the spill.

Finally, extrapolation of local surveys to total populations estimates for PWS is impossible due to the flaws in experimental design cited above.

Study Title: **POPULATION SURVEYS OF SEABIRD NESTING COLONIES IN PWS, THE OUTSIDE COAST OF THE KP, BARREN ISLANDS, AND OTHER NEARBY COLONIES, WITH SPECIAL EMPHASIS ON CHANGES OF NUMBERS AND REPRODUCTION OF MURRES**

Study Number: **BIRD STUDY NUMBER 3** **Study Cost:** **$530,000**

This study attempts to determine whether seabird (principally murre) numbers in attendance at nesting colonies have been reduced following EVOS and is a continuation of a similar study from the 1990 plan. Study sites include the Barren Islands, Kenai Peninsula, and other Gulf of Alaska locations.

This study will not be able to establish that changes in these bird populations are the result of the EVOS. The historical data are extremely outdated (1970's) and limited, and control data are not valid. For example, the Semidi Islands are used as a control site although they are located on the continental shelfbank and are subject to unique oceanographic conditions which influence food supply. Thus, the Semidi Islands are not representative of the habitat in the affected area.

Study Objective(s)

The stated objective, measuring a possible decrease in numbers compared to historical data, will not differentiate oiling effects from other important effects such as climate, weather, food supply, and natural variability. The study as proposed will not be able to demonstrate a causal link between any measured change and EVOS.

Valid comparisons of reproductive parameters between oiled and unoiled colony sites may not be made because of the absence of similar control (unoiled) areas. Demonstration of comparability of control and assessment sites is required by NRDA. In addition, baseline data for nesting productivity is grossly adequate.

Field Methods

It is not clear that the proposed census study properly accounts for the diurnal variability in nest attendance. This variability is known to be often greater than 100%.

The use of boat and land-based surveys results in different levels of reliability making relative comparisons unrealistic.

The justification for secondary emphasis on counts of kittiwakes, cormorants, and parakeet auklets is not discussed. Methods of determining baseline reproductive success of murres is not described. Methods following "conventions of murre monitoring" are nondescriptive, and may lead to biased conclusions.

The use of Middleton Island is mentioned in the introduction as a control site but is not discussed in the methods section. The application of Middleton Island in the interpretation of results remains unclear.

Analytical Methods

The use of the control site at the Semidi Islands is extremely questionable since the Semidi Islands are affected by different oceanographic conditions and environmental influences.

While some historical data do exist at the proposed colony sites, much of the information is outdated and too poorly documented to be valid. As such, the ability to measure recent change for some species populations will be limited. Consequently, it will not be possible to link any change in population status to the spill.

Statistical models are vaguely defined, thereby preventing assessment of their validity for deriving objectives conclusions. It is not clear how the effect

of EVOS will be measured, particularly considering natural variation due to time and location.

Lack of Restoration Focus

There is no indication in the project description of how this census data would be used to design and implement a meaningful restoration program for any of the species observed.

Study Title: ASSESSING THE EFFECTS OF THE EVOS ON BALD EAGLES

Study Number: BIRD STUDY NUMBER 4 **Study Cost: $255,000**

This study attempts to evaluate the impact on bald eagle abundance, distribution, productivity, and survival by a combination of aerial population surveys, helicopter-based productivity surveys, radio tagging, and necropsies of dead eagles. This study is a continuation of a 1990 study.

As in the case of Study B3, the historical data are outdated (1982) and the study fails to consider the other variables that could significantly impact populations. Also, inclusion of the Copper River Basin eagles for comparison is invalid because of different feeding ecology and nesting habitat. In addition, taking blood samples in 1991 is unwarranted given this same eagle population showed normal blood characteristics in 1989, immediately following the EVOS.

Study Objective(s)

Objective A. The objective can not be accomplished because of the lack of comparable baseline or control data. Natural variability of eagle populations in the region remains unknown.

Objective B. Survival rate comparisons require very large sample size across the age structure of the population for validating scientific interpretation. The sample sizes planned are too small and will prevent the testing of hypotheses concerning survival rates.

Objective C. Effects of the radio telemeter on eagle behavior and grossly inadequate sample size will render this objective impossible to achieve.

Objective D. The small amounts and highly weathered state of EVOS oil in 1991 and the absence of exposure pathway suggests that costs and capturing

activities associated with this objective are not warranted.

Field Methods

A. POPULATION SURVEYS

The 1982 data to be used as baseline information are too outdated to be valid and would not be reflective of pre-spill conditions or conditions in 1991 even if the spill had not occurred. Also, the Plan does not indicate whether steps are being taken to ensure that new data will be collected in a fashion comparable to that of the 1982 data.

The locations of "oiled" and "unoiled" sampling areas are not described, nor are the criteria which will be used to distinguish these areas. Baseline data selection methodology is not adequately discussed for a substantive review. Note, inadequate sample design may render the conclusions to be invalid.

The inclusion of areas well outside the spill zone (e.g., Malaspina Glacier) is inappropriate in a damage assessment. The large distance (250 miles) of these areas from the affected area makes their use as control areas invalid. Acquisition of these data is more a research effort than one associated with assessment of injury.

B. SURVIVAL STUDIES

Inclusion of the Copper River Basin eagles in the survival studies appears to be more research-oriented than for assessment of injury. Localized habitat for these individuals differs significantly from Prince William Sound in key respects, including feeding ecology and nesting habitat, thus invalidating the study design to compare eagle data from the two areas.

The Plan proposes that telemetry information on the survival of 30 adult eagles from oiled and 30 from unoiled areas will be compared, presumably to correlate carcass locations for oil related deaths in 1989 to carcass locations from

natural deaths. This proposed radio-tagging program does not account for the natural dispersal of immature eagles and could potentially increase the risk of mortality to fledglings, thus leading to study bias. In addition, these samples are too small to ensure that random samples across the age structure of the population are obtained.

The "oiled" and "unoiled" sampling areas in this program area are not adequately described, especially relative to 1991 shoreline conditions. Lastly, how failure of the radio tags will be taken into account is not provided in the experimental program.

C. TOXIC/SUBLETHAL EFFECTS

The methodology for selection of individual eagles for blood sampling is not disclosed, and nonrandom selection may bias results and confound interpretation.

Post-mortem changes occurring in dead eagles may invalidate the results of any hydrocarbon analyses performed on recovered carcasses.

The "oiled" and "unoiled" sampling areas in this program area are not adequately described nor distinguished.

Analytical Methods

The statistical analyses to be used in this study are only vaguely defined, thus, it is not possible to adequately review or comment on the analytical methods. Study sites are not disclosed, nor are they described adequately. The probabilities of Type I and Type II errors are not given, but appear grossly inadequate for assessing oil affects.

Sample size problems in the survival and carcass recovery studies will prohibit valid statistical comparisons. The carcass recovery study will only show where telemetered birds die, and the small sample sizes will not support objective

conclusions which presumably are to estimate mortality for non-recovered eagles in 1989.

The determination of injury in this study population is heavily dependent on a comparison of the proposed survey data to similar data collected nine-years earlier. While the study may measure a change, it cannot demonstrate that the change was related to the spill, because a host of other environmental influences could have and likely did affect eagle populations over the last nine years.

The studies do not seem to consider the fact that (1) the oil remaining in the environment is highly weathered and of low toxicity and (2) short-term reductions in productivity can have little impact on eagle populations.

Study Title: **INJURY ASSESSMENT OF HYDROCARBON UPTAKE BY SEA DUCKS IN PWS**

Study Number: **BIRD STUDY NUMBER 11** **Study Cost**: **$178,900**

This study attempts to estimate the effects of hydrocarbon uptake on sea duck morbidity, mortality, and productivity. Individuals from 6 species of ducks will be collected from oiled and unoiled sites in Prince William Sound and their histopathology will be examined, with gut samples and tissue samples also analyzed for hydrocarbons. This study is a continuation of a 1990 study with the addition of examination of white-winged scooters.

This study is clearly not warranted due to the healthy populations, as evidenced by the continued permitted hunting of waterfowl in the areas affected by the spill. Moreover, the use of a "predictive analytical model" represents a nonstandard technique for injury determination and is not in accordance with the DOI regulations.

Study Objective(s)

Objective A. It is not appropriate for an NRDA study to be developing a database for food habits of six species of seaducks in Prince William Sound, since these results are highly unlikely to provide data useful to either injury assessment or identification of restoration alternatives.

Objectives B-E. The objectives of correlating hydrocarbon gut and tissue data and morbidity data to predict mortality and reproductive effects on a broader population are unattainable given the scope and design of the program.

Objective F. Harlequin ducks may fly between oiled and unoiled areas, therefore, samples are not independent, statistical assumptions are violated, and results will not be valid.

Field Methods

It appears that ducks will be killed and collected again in 1991. This killing and the fact that permitted hunting of waterfowl has been allowed to continue suggest that the seaduck populations are healthy and that a harvestable surplus exists. As such, the cost effectiveness and need for this study are subject to question.

The study and control sites within PWS and outside of PWS are not defined. The methodology used in selecting the individual sea ducks to be collected at each site is not described. The number of samples to be collected at the control sites is not disclosed. All this indicates that sample sizes will probably be too small for analysis of harlequin duck nesting productivity and development of sound scientific conclusions.

The use of a control site in Southeast Alaska is inappropriate since this site is not likely representative of the spill zone, considering the 500 miles separating the sites.

Techniques of tissue collection and petroleum residue analysis are not described.

Analytical Methods

The predictive model of harlequin duck reproduction losses is not described; therefore, technical comment on the value of the specific qualitative or quantitative modeling process is impossible. However, the "predictive model," will be subject to an inherently large degree of uncertainty due to the ranges of variables used for input. Beyond technical considerations, the use of a predictive model in this fashion represents the use of a nonstandard and not widely accepted technique for injury determination and is not in accordance with NRDA regulations.

Integration of data from other studies (e.g., coastal habitat) will likely be virtually impossible due to the high degree of spatial variation that is present, even on a small scale.

Methodology of fat deposition classification is not described, therefore subjective interpretation may lead to invalid conclusions.

It is not clear how oiling differences will be separated from inherent study area differences (natural variability) in interpretation of data. Any differences in histopathology results between western PWS (oiled) and southeastern PWS/Juneau (unoiled) could be due to natural differences between two distinct subpopulations. Nesting habitat, wintering habitat, and foodbase will influence tissue analysis and confound interpretation.

Lack of Restoration Focus

The absence of identification, evaluation, and implementation of restoration options renders this plan a research exercise that is contrary to NRDA regulations.

APPENDIX - SECTION D

DETAILED COMMENTS ON

FISH/SHELLFISH STUDIES

D. COMMENTS ON FISH/SHELLFISH INJURY ASSESSMENT

The 1991 Plan for Fish/Shellfish injury assessment contains brief outlines for 10 studies but it remains substantially unchanged from the 1990 Plan outline provided for retrospective public comment in October of 1990. Only the study of crabs outside of PWS has been eliminated and other studies of demersal fish and shrimp have been moved to a new category termed Subtidal.

It seems irrational to continue a multi-million dollar program to investigate spill effects on fish when the evidence of their good health is so compelling. After a tremendously successful 1990 fishing season and after yet another successful near-record 1991 herring season, further attempts to substantiate assertions of injury to fish populations are wasteful of resources. Once again, it is clear that the Trustee Council has departed from a sound, balanced approach in which both sides of the issue (injury and recovery) receive equal consideration.

Even if further studies were warranted, this Plan does not contain sufficient detail to support a comprehensive review of study design, field methods or results interpretation. Unfortunately, it appears from the short summaries provided and the text of the Public Review Comments (Appendix D) that the Trustee Council have not incorporated previous review comments in any substantive way to effect meaningful changes in either program scope or study content. Exxon has consistently registered the objections outlined below to both the 1989 Draft Plan and 1990 Plan. Key points are discussed below and these are followed with detailed review comments for each individual study.

Extensive fishery studies are not warranted in light of the record 1990 and 1991 fishery seasons and the positive indicators of ecological health.

The 1991 purse seine herring fishery has just concluded an extremely successful season. The catch was the second largest ever recorded at 11,924 tons, 44% larger than even the 1990 catch and 62% larger than the average harvest from 1980 through 1990 (excluding 1989 closure). This season's catch, in combination with the highly successful 1990 catches of both herring (8300 tons)

and pink salmon (44.7 million fish), underscores the robust health of the PWS fisheries in general.

The record catches provide the most compelling evidence of the lack of significant injury to these fish populations, thus precluding the need for extensive study of potential oil impacts. Furthermore, results of the subsistence sampling program conducted jointly by NOAA, ADF&G and Exxon provide convincing evidence that fish from throughout the spill-impacted area do not contain hydrocarbons above background levels. Further, no problems exist with shellfish, except for those collected from the very few obviously oiled areas. Even then, risks for consumption, if any, are extremely low according to the USFDA health risk assessment[1] issued August 9, 1990.

Proposed methods for the measurement of sublethal, chronic effects are not validated, are research-oriented, and cannot be correlated with population level impacts.

The use of mixed function oxidase (MFO) levels in fish tissues as a means of assessing hydrocarbon contamination is clearly research. These measurements may indicate PAH exposure but can also vary according to species, food type and amount, reproductive state, and season. There is no evidence that the changes in MFO's and other subtle factors being monitored can be related to EVOS or that they correspond to changes in populations. The investigation of these parameters seems to be related to furthering research rather than assessing damage. (FS2, FS4, FS5, FS11, FS13)

Biochemical measurements, such as bile fluorescent aromatic hydrocarbon concentrations and enzyme level changes, are non-specific indicators of hydrocarbon exposure, are highly variable due to purely natural causes, cannot be directly or positively related to EVOS, and cannot be correlated with population level impacts. (FS2, FS13)

Numerous studies may provide useful population management data but are not required for damage assessment.

Much of the work appears to be related to furthering fishery management practices, performing fishery management related studies, and updating historical records. Many of the fishery studies will provide population management data of little relevance to oil spill-related effects. A better understanding of the general ecology and population dynamics of PWS fish species has long been the goal of fishery scientists working in private and public sectors. Many of these studies will provide data which may be useful to long-term management goals but are not required to assess oil spill impacts and, therefore, are not compensable. (FS2, FS3, FS5, FS27, FS28)

Statistical study designs are not likely to distinguish differences between oiled and unoiled areas.

The fundamental study designs for many of the Fish/Shellfish studies contain a common flaw: The studies are designed to detect differences between oiled and unoiled areas and not to identify the causes of those differences. Many of the Fish/Shellfish study designs suffer from statistical problems in distinguishing the effects of oiling, physical location and timing. Also, many studies are based on the development of data from oiled and control "unoiled" sites. In most cases adequate information is not provided to establish that migratory fish have not traversed between "oiled" and "unoiled" areas, and that selected control sites are ecologically similar to oiled sites. It will be very difficult, and in many cases impossible, to determine if a statistically significant difference was due to EVOS or simply to natural biological variation in time and space. (FS2, FS5, FS13)

Studies do not adequately consider the high degree of annual variability in historical baseline fishery populations.

A review of salmon population dynamics in Prince William Sound indicates a high degree of variability between stocks. Since differences between wild and

hatchery stocks are not clearly understood by the fisheries managers of the area, it will be impossible to adequately describe the subtleties of historical population dynamics, and even more difficult to relate responses to hydrocarbon exposure levels. (FS3, FS4, FS5, FS27, FS28)

Recruitment to fish and shellfish populations is also highly variable from year-to-year, resulting in equally variable commercial catch statistics and escapement numbers. Most of the fishery studies do not adequately consider this high degree of variability or the lack of reliable baseline data. Detection of differences exclusively due to oiling will not be statistically possible. (FS4, FS5, FS13)

Several fish/shellfish studies do not adequately consider the myriad of other natural variables which clearly affect key life cycle events of these species. It is not apparent that the sampling programs will capture the information necessary to determine what portion of the expected biological variability is a function of hydrocarbon contamination versus numerous other natural factors. (FS2, FS3, FS4, FS5, FS11, FS27)

Literature data citing significant biological effects at hydrocarbon concentrations of a few parts per billion is cited out of context as an attempt to justify field programs.

Literature references exist that report sublethal effects of fresh crude oil to invertebrates and fish at concentrations of a few parts per billion. However, these are laboratory toxicity studies performed under worst-case exposure conditions with continuous addition of a water soluble fraction of fresh crude oil. Extensive water quality monitoring data[2] throughout PWS and the Gulf of Alaska confirm that hydrocarbon concentrations remained well below concentrations that have been shown to be toxic or cause harmful sublethal effects in marine animals.

Field sampling strategies do not adequately consider the high degree of variability in trace oil distribution throughout the impacted areas.

Oil distribution within PWS, even immediately after the spill, was extremely variable with respect to both space and time. Areas to be sampled in several Fish/Shellfish studies are broad and necessarily represent a wide range of extremely low level hydrocarbon exposures within an area. Given the highly variable nature of these exposures, it is unlikely that these sampling designs will be able to relate observed biological responses to any particular hydrocarbon concentrations. Thus, most studies will likely do nothing but further describe the well-known high level of biological variability seen in these systems. (FS1, FS2, FS3, FS4, FS5, FS11, FS27, FS28)

References

1. U.S. Food and Drug Administration. "Report of the Quantitative Risk Assessment Committee: Estimation of Risk Associated with Consumption of Oil-Contaminated Fish and shellfish by Alaskan Subsistence Fishermen Using A Benzo[a]pyrene Equivalency Approach." Advisory Opinion on the Safety of Aromatic Hydrocarbon Residues Found in Subsistence Foods that were affected by the Exxon Valdez Oil Spill. Submitted to the Alaska Oil Spill Task Force by the U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition, Washington, D.C.; August 9, 1990.

2. Neff, J.M. (Senior Consultant, A.D. Little). "Water Quality in Prince William Sound and the Gulf of Alaska." Cambridge, Massachusetts: Arthur D. Little; 37 pp.; March, 1991.

Study Title: INJURY TO SALMON SPAWNING AREAS IN PWS

Study Number: FISH/SHELLFISH STUDY NUMBER 1 **Study Cost: $288,000**

This study attempts to evaluate the effects of oil on the intertidal spawning behavior of pink and chum salmon in Prince William Sound. Methods include visual observations, aerial photography, and hydrocarbon analyses of mussel tissues, with surveys planned in almost 140 streams.

Study Objective(s)

Any study of potential spill impacts on pink salmon seems particularly unnecessary in light of the extremely strong returns of 1990. As juveniles in 1989, this year class was at the highest risk for exposure to oil. Their highly successful return as adults in 1990 provides most compelling evidence of lack of significant effects for that year class. For subsequent year classes where risks of exposures to oil are significantly less, a similar lack of significant effects is highly likely.

Objective D. The criteria used to select streams for survey are largely subjective and unrelated to the spill. The utility of anticipated results for application to non-surveyed streams will be marginal.

Objective F. Since the observers know the study design and the particular streams being used to estimate correction factors, there is inadequate control for observer bias.

Objective H. Recalculating historical escapement to 1961 is of no relevance to impact assessment for a 1989 spill. Survey and environmental parameter estimates based on conditions that have prevailed for the past three years can not be applied as a correction to the past thiry years.

Objective I. The methods described will provide an estimate of average wetted area under conditions that prevailed when the measurements were taken. The relationship between this variable and "area-available-for-spawning" is not known for the study streams.

Objective J. The descriptions provided for this study and FS2 do not specify how the aerial photographs will be used to select sampling locations. Methods used to select the locations are important for evaluation of potential bias.

Field Methods

Application of the criteria for selection of streams to be surveyed is not clear. For example, does each stream selected have to meet all, some, or one of the criteria?

The information provided is not sufficient to evaluate the potential application of results to injury assessment. The types of data pursued in this study are usually characterized by considerable uncertainty due to uncontrolled environmental and biological factors. The Plan does not discuss the potential for uncontrolled variables, how knowledge of these variables entered into development of the study design, nor how these factors will affect statistical analyses and interpretation of results. Related to this shortcoming, the Plan does not discuss how the subjective choice of study streams will affect the application of assessment results to non-study streams. Criteria for selecting treatment and control sites are not given.

This study indicates that a sample of mussels from the intertidal area will be analyzed to document the impact of oil on a given stream. However, there is no mention of any attempt to test the implicit assumption that the level of hydrocarbon contamination in nearby mussel populations is comparable to exposure in the stream.

The Plan does not identify the selection criteria or a plan for developing criteria to select the appropriate technique for estimating fish life in the stream. This suggests that the selection may be arbitrary. In light of this, a standard technique for providing an unbiased estimate of fish life in the stream should be utilized. If not, this will affect the accuracy of escapement estimates.

The criteria used for separation of streams based on their exposure to oil is not clear. In one place the Plan says this will be based on visual inspection, and in another section the Plan says this will be based on levels of hydrocarbons in mussel tissue sampled near each stream. Both of these methods have weaknesses that will affect the basic categorization of streams for the purposes of this study. This will leave the analysts with comparisons of weakly categorized groups of streams for data sets that have inherently large variances and thus lead to inconclusive results.

Analytical Methods

Statistical procedures are vaguely defined. It is not clear how effects of EVOS are to be estimated and tested.

The level of effect due to EVOS and effort needed to detect that effect are not defined. Sampling effort may not be appropriate to meet objectives. The probability of declaring an effect when there really is not one, Type I error, is not given. The probability of failing to find an effect when there really is one, (Type II error), is also not given.

Log-linear models for contingency table analysis are inappropriate since the data will represent estimated (rather than absolute) counts, there is a lack of temporal independence between years, and there is a need to test effects based on streams-treated-alike and not multinomial sampling error. Methods do not indicate that covariates for stream size, spawning area, etc., will be used to adjust for differences not randomized to strata.

Effects of oiling, location, and time are confounded. It will be difficult, if not impossible, to determine if a statistically significant effect was due to EVOS or natural variation due to time and location.

In general, the type of data that will result from this study have large variances among sites and times. The study methods and analytic approach do not seem to address, or attempt to control for, these potential analytic problems. Therefore, the results will be of questionable value.

The Plan does not indicate whether or not other variables which clearly affect spawning activity are being considered in this evaluation. It is not apparent that the sampling program will capture the information necessary to prove that a significant portion of variability in escapement is a function of oil contamination versus other factors.

Study Title: INJURY TO SALMON EGGS AND PRE-EMERGENT FRY IN PWS

Study Number: FISH/SHELLFISH STUDY NUMBER 2 **Study Cost: $259,000**

This study attempts to estimate mortality of pink salmon eggs over the winter incubation period and to estimate incremental mortality caused by EVOS. Methods include fry tissue hydrocarbon analysis, field measurements of egg and fry densities in 48 streams, and estimates of over-winter mortality.

Study Objective(s)

Objective B. The statistic named "overwinter mortality" in the Plan is actually the result of a calculation of the change in mean density estimates from eggs to alevins. Factors other than mortality can cause changes in density among tidal zones. The Plan does not discuss these factors and how they will be accounted for in data analysis and interpretation.

Objective C. The use of MFO levels in eggs and alevins as a means of assessing hydrocarbon contamination is clearly research. The use of MFO to demonstrate injury is an unproven technique which shows a great deal of variability among life stages, seasonal factors, food sources and other factors.

Objective D. The criteria used to select streams for survey are largely subjective and unrelated to the spill. The utility of anticipated results for application to non-surveyed streams will be invalid.

Field Methods

The information provided is not sufficient to evaluate the potential application of results to injury assessment. The types of data pursued in this study are usually characterized by considerable uncertainty due to uncontrolled environmental and biological factors. The Plan does not discuss the potential for uncontrolled variables, how knowledge of these variables entered into

development of the study design, nor how these factors will affect statistical analyses and interpretation of results. Related to this shortcoming, the Plan does not discuss how the subjective choice of study streams will affect the application of assessment results to non-study streams.

This study indicates that a sample of mussels from the proximity of the stream bed will be used to determine the amount of hydrocarbon impacting the stream. There is no apparent attempt to test the assumption that hydrocarbon levels in nearby mussels are representative of hydrocarbon levels directly related to exposure of the stream. This methodology is not an appropriate means of measuring hydrocarbon contamination and undermines the basis upon which the data are being evaluated.

Given the fact that shoreline contamination by EVOS has decreased considerably since 1989, it is not clear that analysis of mussels can quantitatively discriminate EVOS hydrocarbons from other natural/anthropogenic background hydrocarbons. The selection of study streams introduces a potential bias to the design. Most of the treated (oiled) streams were from the group termed "new additions." These streams, as compared to those in the traditional index list, are typically less productive and, thus, naturally bias the results.

Analytical Methods

Statistical procedures are vaguely defined. It is not clear how effects of EVOS are to be estimated and tested.

There is no evidence that sufficient variables are being considered with which to identify major proportions of variability in egg to fry mortality.
It is not apparent that the program will capture sufficient information to make an accurate assessment of oil effects versus other environmental factors.

The determination of injury is dependent upon the ability to discriminate oiling levels. No appropriate means of defining oiling levels are being

utilized thereby precluding the ability to assess injuries attributable to the spill.

Study Title: SALMON CODED-WIRE TAG STUDIES IN PWS

Study Number: FISH/SHELLFISH STUDY NUMBER 3 **Study Cost: $1,075,000**

This study attempts to estimate the survival and harvest rate of five species of hatchery salmon and wild pink salmon through tag and recapture studies. The field methods are based on the use of coded wire tags (CWT) implanted in juvenile fish prior to release and subsequent documentation of returns taken by the commercial fishery.

The Plan states that FS3 is being "transitioned" to a restoration program, yet no injury is identified. The Plan should specify what is being restored, and how the study will facilitate restoration. Without this information, evaluation of the value of this study for restoration is not possible.

Study Objective(s)

Objective A. It is unclear how this objective will be used to evaluate effects of the spill on hatchery-released salmon. The data gathered for this objective appear to be solely for the use of hatchery managers. The tie to oil effects is nebulous, simply stated as "Outmigrating smolt and returning adults from these facilities [hatcheries] are exposed to oil in the environment."

Objective B. While it may be possible to obtain a rough estimate of the catch of wild stock pink salmon using these tag results, it is not likely to produce information on spill-related effects.

Objective C. Field methods are not sufficiently detailed to evaluate the validity of success for this study.

Objective D. Differences in survival rates that may be detected will provide little insight into the effects of the spill. There are inadequate baseline data for historical comparison and there is no measurement of exposure to oil.

Field Methods

The Plan states that "The extent to which the survival and behavior of the tagged fish can be extrapolated to other groups of salmon will be assessed at the time of recovery". The Plan does not even describe criteria the analysts will use to classify areas as oiled or unoiled. Since that classification is at the core of the entire study, it should be understood well enough to be described clearly in the Plan.

The level of replication (pink salmon: 2 oiled and 3 controls; sockeye: 2 oiled and 1 control) is inadequate for all but the grossest effects to be observed or for simple descriptive investigations.

The methods section states "The tag rate was held constant across release groups to prevent confusion of differential tag mortality with variation in survival between release groups." However, for species other than pink salmon, the tag rate is different among groups. The approach is apparently inconsistent.

Analytical Methods

The description of the statistical procedures in the Plan is incomplete. Analysis of CWT data uses a modification of Clark and Bernard (1987) that estimates sampling error; no discussion is provided on how this step leads to a test of impact that must incorporate spatial/temporal variance.

In addition, interpretation of the variance formula is incorrect. The formula does not "ignore covariance between release groups"; rather, it ignores the covariance between catches of strata within a single release. Furthermore, the formula is an estimate of the variance [i.e., $Var(C_1)$ or $Var(C_1)$] and not the variance as denoted.

In general, the methods for analyzing CWT data do not include plans for handling problems of comparing tag recoveries when catch effort used in tag

recoveries vary between release groups because of heterogeneous spatial and temporal entry into the fishery.

The utility of these data for assessment of spill-related damages is doubtful. Inter-annual and inter-facility variation of survival for hatchery stocks has been so large that any observed differences will be difficult to interpret. Each hatchery differs in location, management, stock, and other factors that will affect survival. In addition, sampling error is likely to vary among locations, fisheries, stocks, and times. It is not likely that any observed differences in survival among stocks could be ascribed to a spill effect, even if the observed survivals fit a pre-defined pattern based on the possibility of effects. All steps in the sampling and estimating procedures, as described, typically have large associated variances. The resulting survival/mortality estimates that could be used to compare locations with different oil-exposure histories would have such large confidence intervals that interpretations will be suspect.

Study Title: **EARLY MARINE SALMON INJURY ASSESSMENT IN PWS**
Part I: Impacts of Oil Spill on Migratory Behavior and Growth

Study Number: **FISH/SHELLFISH STUDY NUMBER 4 Part I** **Study Cost:** **$136,400**

This is part I of a two-part study and attempts to distinguish between the effects of oil and other factors on growth and migration of salmon fry by resampling areas examined in 1989 and 1990.

While information provided by this study may be useful from a fishery or hatchery management standpoint, it is not likely to yield meaningful information for EVOS damage assessment.

Study Objective(s)

Objective A-1. The comparisons will be among fish captured in areas categorized as oiled or unoiled. The relationship between areas of capture and areas where the apparent growth occurred is unknown.

Objective A-3. The use of MFO to demonstrate injury is an unproven technique which shows a great deal of variability among life stages, seasonal factors, and food sources.

Objective A-4. The Plan does not discuss potential effects of hatchery operations and procedures on the study analyses and interpretation of results.

Objective A-5. See comment for objective A-4.

Objective A-6. See comments for objectives A-1 and A-4.

Objective A-7. See comments for objectives A-1 and A-4.

Objective A-10. The use of an untested model developed for a shallow, arctic lagoon does not cure the statistical problems in the sampling design. Further development of the model for application to Prince William Sound will do little to further injury assessment or restoration.

Objective D-1. See comment for Objective A-4.

Field Methods

The descriptions of methods are insufficient to fully evaluate the design and potential results of this study. The distribution of sampling effort in time and space must be known to determine whether the study design can achieve the stated goals. The Plan does not describe criteria the analysts will use to classify areas as oiled or unoiled. Since this classification is at the core of the entire study, it should be described clearly in the Plan.

Analytical Methods

Reliance on a "bioenergetics model" to estimate growth will have a subjective influence on the relation of spill impacts to fish growth. For example, how are model validation and sensitivity analyses incorporated in the inferential process?

"Chi-square tests on the proportion of stomach content weights" are inappropriate since chi-square tests are restricted to analysis of count data, not the proportions or continuous random variables.

A test of impact based on a comparison of abundance "between oiled and unoiled locations" is a confounded test of impact. This type of test in FS4 and elsewhere is confounded with inherent differences in location effects that are not and cannot be randomized. Use of a nonparametric test does not alleviate the problem.

There is no indication how differences caused by geographic effects will be separated from "oiled" versus "unoiled" effects, where the primary definition of "oiled" and "unoiled" is based on geography. In addition, the study design, as described, introduces a stock related bias that is not controlled or tested. The Esther and AFK hatchery stocks have inherent genetic differences and the degree to which these differences affect characteristics important to this study are unknown. Captures of tagged fish from the AFK hatchery will likely occur mostly in the southwest portions of the Sound, while captures of tagged fish from the Esther hatchery will likely occur mostly in the northern and northwestern sound. These broad areas roughly coincide with the oiled and unoiled areas used in this study. Further, since most of the oiled areas occur in one part of the Sound and unoiled areas occur in another, there are factors other than history of oil exposure that would affect the variables measured by this study. For example, if juvenile salmon are not exposed to the same type and rate of predation in the two areas, any apparent differences in growth rate could be due to differential size-selective predation. There are many potential stock-area interactions that are not controlled or tested with the described study design.

Study Title: **EARLY MARINE SALMON INJURY ASSESSMENT IN PWS**
Part II: Impacts of Oil Spill on Juvenile Pink and Chum Salmon and Their Prey in Critical Nearshore Habitats

Study Number: **FISH/SHELLFISH STUDY NUMBER 4 Part II** **Study Cost:** **$172,000**

This study attempts to analyze the abundance and overall habitat utilization of juvenile pink and chum salmon. Methods include field sampling of fish and fish food organisms via tow and seines and a dosing study using crude oil as feed.

Study Objective(s)

Objective D-E. Continued processing of samples collected in 1989 and 1990 requiring additional funds beyond those previously allocated implies a lack of adequate study planning and program management. Annual plans have been represented as stand-alone budget commitments rather than starter programs requiring subsequent budget authorizations to complete the scope of work indicated.

Objective F. Determining the relationship between oil ingestion and survival is purely research and will not lead to findings which are meaningful to natural resource damage assessment and restoration planning. This objective is designed to elicit biological responses which likely have no relevance to actual levels of environmental exposure during or following the spill.

Field Methods

The detailed measurements and analyses being proposed to evaluate for effects on abundance, distribution, habitat utilization, size, growth rate, feeding habits, and migratory behavior, are all governed by the appropriateness of the field sampling program. The results will need to include a careful evaluation of geographic variability to separate potential effects of oil from natural differences in these parameters in different portions of Prince William Sound.

The abundance and distribution of copepods and meiofauna are dependent on many factors other than oil. This study does not address sufficient variables to adequately determine either abundance or the reason why they are in a particular area with any degree of statistical significance.

Analytical Methods

The results of the dosing study using crude oil and feed will largely depend on the test protocol. Oil exposure in the marine environment varied in both quantity and chemical nature of the oil. The experiment varies only the quantity of crude oil but not the degree of weathering and composition. Thus, this program will produce results unrelated to the EVOS for which hydrocarbon concentration and chemical nature change overtime.

Study Title: INJURY TO DOLLY VARDEN CHAR AND CUTTHROAT TROUT IN PWS

Study Number: FISH/SHELLFISH STUDY NUMBER 5 **Study Cost: $325,100**

This study attempts to examine potential impacts of oil on the survival and growth rates of Dolly Varden char and cutthroat trout. Field methods are based on the tagging of fish as they leave freshwaters and, subsequently, monitoring growth and survival of returning tagged fish.

Study Objective(s)

The elements of this study remain essentially unchanged from the 1990 Plan. The study attempts to examine potential impacts of oil on the survival and growth rates of Dolly Varden char and cutthroat trout.

Analytical Methods

As with the previous year's study, the design suffers from the same fundamental flaw: an inability to attribute any potentially observed differences in survival or growth rate of fish to oil-related effects. As noted in Appendix D, the study authors point out that differences "between control and oiled groups would be attributed to some external disturbance." Therefore, without any basis to relate effects to oiling, resultant differences in growth and survival rates could be caused by any one of a myriad of ecosystem variables encountered by fish stocks between the study areas. Differences may well be apparent between the study groups but no analysis is included to test for cause and effect due to oiling versus natural variability or geographical differences.

It is unlikely that "all migrating fish can be examined for marks," in which case, the simple estimate of population size ($S=M_2/R_1$) will not be appropriate.

The three-sample Jolly-Sebert model will provide an estimate of survival for only the period 1989-1990, assuming the three capture samples in 1989, 1990,

and 1991. Consequently with only post-spill sampling, comparisons of survival before and after the spill will not be possible. Comparisons will be limited to contrasts between oiled and unoiled areas and not pre- and post-spill.

Comparison of 95% confidence intervals is an invalid means of testing differences between oiled and unoiled conditions since such a comparison must be based on the variance among streams-treated-alike.

Injury Determination Methodology

There is no indication of how the results will be analyzed to demonstrate linkage between survival or growth differences and oil spill effects. There are likely to be differences in survival and growth because of natural differences between the studied populations. Data are not being gathered to analyze for spill-related effects.

Due to the clear inability of this study to establish a causal link to EVOS, or to quantify injury caused by the spill, the study must be interpreted to be a research or resource management exercise. As such, the expense of continuing this study is not compensable and is unnecessary for EVOS damage assessment.

Study Title: **INJURY TO PWS HERRING**

Study Number: **FISH/SHELLFISH STUDY NUMBER 11** **Study Cost:** **$558,000**

This study attempts to develop the data needed to refine estimates of herring biomass in Prince William Sound. Field sampling will include measurement of herring spawn deposition, adult age, weight, length, and growth, as well as egg survival and egg loss estimates. Data will then be summarized in an attempt to increase accuracy of biomass estimates and relate any observed effects to EVOS.

The continued significant expenditure ($558,000) in 1991 on herring studies is not warranted in light of the apparent good health of the resource and the lack of indications from prior years' studies of significant concerns. This is clearly a fisheries resource management exercise and is not compensable under NRDA.

Study Objective(s)

This study is microscopically focused and fails to acknowledge the obvious indicators of the strength of herring fishery stocks based upon the extremely successful 1990 and 1991 PWS herring fisheries.

Objective A-1. The ability to measure the biomass to within +/-25% in future years will not provide the resolution necessary to measure possible EVOS injury.

Objective A-2. The AWLS (Age, Weight, Length, and Size) composition of the herring in PWS will depend upon adequate sampling of the herring during the test fishery. The Plan does not provide sufficient detail to determine whether a true representation of AWLS will be achieved. Furthermore, if the test fishery does not provide sufficient specimens, the samples must be provided from the commercial fishery. Those fish will not be representative of the composition of animals available since the fishery focuses its effort on the

fish containing the most roe. Since AWLS information is vital to determination of biomass, unrepresentative data undermine the ability to appropriately determine biomass.

Objective D. Hydrocarbon burden does not necessarily produce tissue injury. Tissue damage, if present, may have resulted from other chemical or natural exposures during the course of annual migrations of these animals. Tissue injury attributed to oil exposure must be evident from oil spill studies. Laboratory studies that have evaluated fish tissue histopathology two-years after hydrocarbon exposure should be clearly referenced in the Plan.

Objective F. The Plan states that the goal of this work is to determine whether EVOS will have a measurable effect on the herring population. There are no studies which demonstrate population level impacts from sublethal effects at exposures of this magnitude. MFO and cytogenetics analyses are experimental and results vary with diet, season, spawning activity, etc. These experimental measurements are not an acceptable measure of injury under NRDA regulations nor do they relate to population level effects.

Objective G. The estimation of egg loss due to wave action or predation is not related to EVOS damage assessment.

Field Methods

The diver surveys for spawn estimation are based on an inadequate sample design. Kelp must be taken to a laboratory for adequate estimation of egg cover. The samples selected for diver calibration must be representative of the available plant type and egg cover to be acceptable in "correcting" the diver estimates. No limits of acceptability for this are presented in the Plan. This process undermines the ability to adequately estimate egg production.

Divers estimating the egg cover on plants appear to be using inadequate means of measuring distance offshore. Measuring distance from MLLW perpendicular to the shoreline is necessary to calculate the size of the spawning beds. A poor measuring system results in a poor estimation of egg deposition and, ultimately, biomass.

Egg loss will be measured in the field. Herring exhibit density dependent survival and there are no means of identifying the degree to which this affects year-class production. As there is no apparent relationship between herring spawning biomass and subsequent recruitment, the loss of eggs is meaningless in the context of this study.

The egg survival studies are being conducted at only three locations which limits the investigation to an observational study of little consequence. The power of the study to resolve effects throughout the impacted region will be extremely limited.

The 12-16 dives to assess survival are proposed to be included as a factor in the ANOVA indicated by model Eq. 15. In actuality, these constitute repeated measures on only a few replicate locations. The repeated measurements on successive dives are not independent and violate the assumption of independence in ANOVA. This Plan is inconsistent in its application of statistical methods. Repeated measurements at the same site are acknowledged in the fry sampling but need to be resolved in the egg survival.

Analytical Methods

The biomass which will be estimated in 1991 will not include the fish which are the product of 1989 egg production. The Plan indicates that there were no significant 1989 adult mortalities. Therefore, it appears that this is necessary for herring resource management and has nothing to do with determining EVOS impact.

The statistics seem to be geared toward use of data which have a poor fit to the models utilized. This confirms that the biomass estimation is extremely poor and of little value in determining EVOS damage.

There is no description for the oil exposure study. It is not apparent whether the effort is to model the 1989 exposure to fresh oil or exposure to weathered oil both of which differ greatly in character. There have been a great many studies which have developed worst case laboratory representations of oil exposure. Since these are not representative of what happens in the field, as is evidenced from the 1990 and 1991 PWS herring fisheries and the lack of 1989 adult mortalities, it is not apparent what value this study has.

The test of effects on fecundity based on comparison among five areas of sampling bears no relationship on EVOS exposure. The test proposed is based on subsampling. This test is also selecting individuals of a specific length range near the mean size. This sampling will produce a fecundity-weight relationship that will not be representative.

Laboratory Methods

An oil exposure study is cited as "the major addition to the 1991 herring study." Absolutely no details are given regarding the justification for this component nor how such a study will be designed and what types or responses will be tested for. This lack of information indicates that this component has not been thoroughly planned nor justified within the context of restoration.

Study Title: EFFECTS OF HYDROCARBONS ON BIVALVES

Study Number: FISH/SHELLFISH STUDY NUMBER 13 **Study Cost: $147,000**

This study attempts to determine the effects of oil contamination of intertidal sediments on the survival, growth, tissue damage, and recruitment of one species of intertidal clams. Methods proposed for use include digging and sampling clams from specific transects in intertidal areas at low tide periods. Additional clams will be transplanted to previously oil-impacted shorelines and subsequently sampled for hydrocarbon uptake as well as growth measurements.

Study Objective(s)

Objectives A-C. These objectives are the same as in 1990, except that they refer to one species not three. While the stated objectives do consider the available scientific literature on effects of oil on intertidal clam populations, the study design greatly underestimates the natural variability in all the biological and chemical parameters that will be measured. Therefore, it is unlikely that the stated objectives will be accomplished.

Field Methods

The field sampling methods are confusing and flawed. Sediment samples for hydrocarbon analysis and clam samples for growth from all three positions at a given tide level are composited into single samples, obscuring any gradients of chemical and biological response at different levels on the shore.

The amount of sample replication at each site may not be sufficient to statistically detect any but the largest differences among sites. Likewise, it will be difficult to distinguish differences due to natural causes from those due to the presence of oil in the sediments or the clam tissues.

No meaningful methods are provided to determine restoration approaches. Only a cursory statement "appropriate suggestions will be made for restoration or mitigation measures" is provided. The reader is left with the obvious conclusion that no meaningful restoration methods are either warranted or available.

Analytical Methods

Necropsy (gross examination of dead tissues) will be unlikely to yield useful information.

Statistical Methods

The sample size for estimating clam growth is reduced from 150 to 3 study sites because of pseudoreplication and the growth measurements are not adjusted for clam territories.

The Plan does not describe how the most appropriate growth model will be chosen. It is not clear how graphical comparisons can be used to test the significance of the observed differences.

The Plan does not explain how the different levels of variation (oiled versus unoiled, among sites, among shore-level strata, within shore-level strata, among individuals within a quadrat, etc.) will be treated in the comparisons.

Injury Determination Methodology

The parameters being measured are quite variable over small temporal and spatial scales. Because of this, it will be difficult to adequately characterize the baseline condition. Quantification of injury attributable to the spill or subsequent cleanup efforts is not likely to be possible based upon the study design. Background histopathology is poorly understood at best, and thus it will not be possible to ascribe any observed effects to EVOS.

Moreover, relationships between observed histopathology and oil-related effects on survival potential of natural mollusk populations have not been accurately established. Thus, the significance of any observed effects is questionable.

Recommendations regarding human consumption due to public health issues are not an appropriate component of restoration and are not within the purview of the Trustee Council. The implication that such recommendations are required ignores the positive findings of the Oil Spill Health Task Force and the U.S. Food and Drug Administration[1] regarding the safety of shellfish consumption.

Reference

1. U.S. Food and Drug Administration. "Report of the Quantitative Risk Assessment Committee: Estimation of Risk Associated with Consumption of Oil-Contaminated Fish and Shellfish by Alaskan Subsistence Fishermen Using a Benzo[a]pyrene Equivalency Approach." Advisory Opinion on the Safety of Affected by the Exxon Valdez Oil Spill. Submitted to the Alaska Oil Spill Task Force by the U.S. Food and Drug Administration, Center for Food Safety and Applied Nutrition, Washington, D.C.; August 9, 1990.

Study Title: SOCKEYE SALMON OVERESCAPEMENT

Study Number: FISH/SHELLFISH STUDY NUMBER 27 **Study Cost: $334,300**

This study is essentially unchanged from the 1990 Plan and is designed to determine what, if any, effects result from overescapement. Overescapement is the result of fishery management practices, thus this study is not an EVOS impact assessment study. Historical data for the three "impacted" lake systems clearly document that escapements comparable to 1989 and higher have been allowed for these systems within the past ten years. These higher escapements were the result of fishery management decisions and resulted in no obvious deleterious or long-term effects on either the nursery lake ecosystems or the resulting adult escapements.

Study Objective(s)

Objectives A-B. The determination of number, age, and size of sockeye salmon juveniles in selected freshwater systems is of very marginal use in determining injury attributable to EVOS since no oil ever reached this freshwater spawning habitat.

Objective C. The large escapements resulting from fisheries closures are a result of fisheries management decisions. Escapements have been allowed for "impacted" lakes in the recent past which were comparable and larger than 1989. Thus, there is no justification for this study.

No scientific hypotheses are stated. Thus, it is impossible to assess whether or not the study design is adequate to establish a significant level of injury due to overescapement.

Field Methods

Field methods are intended to perform fisheries research unrelated to EVOS.

Sockeye salmon overescapement was a result of fishery management decisions and is not directly related to EVOS.

Injury Determination Methodology

This is a resource management data gathering exercise with no apparent scientific contribution to EVOS injury quantification or restoration planning.

Study Title: SALMON OIL SPILL INJURY MODEL AND RUN RECONSTRUCTION

Study Number: FISH/SHELLFISH NUMBER 28 **Study Cost: $175,800**

This study attempts to develop both life history and run reconstruction models for use in determining impacts attributable to EVOS.

Study Objective(s)

Run Reconstruction

Objective B. This objective states that historical data will be analyzed to develop estimates of model parameters yet a great deal of the work comprised in FS1-FS10 appears to focus on the correction of historical values. It appears that the Trustee Council intend to correct a great deal (up to thiry-years worth) of those historical data based upon the results of recent data collections. These data are being collected at a time when the wild stocks are in recovery from overfishing. The correction of historic data based upon data collected while these stocks are in transition is invalid.

Life History Modeling

Objectives B-D. It is not apparent that a meaningful status quo can be defined with or without an oil spill in PWS. Since the inception of fisheries enhancement in PWS, the wild stocks have been overfished to the point that escapement goals could barely be met. The wild fish which comprised 100% of the annual catch ten-years ago have been reduced (relatively) to less than 15% of the annual catch in recent years. Under these circumstances it is impossible to determine the "status quo".

Methods

The anticipated performance of the life history modeling and run reconstruction

approaches are not discussed. An evaluation of the anticipated power of the methods to assess effects needs to be discussed in light of Peterman and Bradford (1987) and Peterman (1989) who indicate extremely low statistical power using stock assessment techniques.

The project description does not include any apparent plan to conduct model verification or sensitivity analysis in making inferences about the presence or absence of effects. Errors in parameter estimates and model simplifications need to be measured and contrasted with estimation of any perceived effects.

This type of modeling has not been used in the management of PWS fish in the past. Since the fishery managers have not trusted this type of model to manage their stocks, it is extremely doubtful whether there is any validity in using it to quantify injury from the spill.

Given the inherent weaknesses of the models and the questionable validity of assumptions used in the models, it is unlikely that any valid injuries or meaningful restoration strategies can be assessed.

References

1. Peterman, R. M. 1989. Application of statistical power analysis to the Oregon coho salmon (Oncorhynchus kisutch) problem. Can. J. Fish. Aquat. Sci. 46:1183-1187.

2. Peterman, R. M., and M. J. Bradford. 1987. Statistical power of trends in fish abundance. Can. J. Fish. Aquat. Sci. 44:1879-1889.

Study Title: **DATA BASE MANAGEMENT**

Study Number: **FISH/SHELLFISH 30** **Study Cost**: **$175,800**

Study Objective(s)

Objective A. The construction of a database system to maintain both historical and spill-related data is not under the purview of NRDA regulations.

Objective B. The structural facilities to house the above database system are not under the purview of NRDA regulations.

Methods

The Trustee Council indicate that more than thirty-years of historical fisheries data are available to them. These data are obviously maintained on a computer system already so it is not apparent why a new database system is required.

APPENDIX - SECTION E

DETAILED COMMENTS ON

COASTAL HABITAT STUDIES

E. COMMENTS ON COASTAL HABITAT INJURY ASSESSMENT

The 1991 Plan describes two Coastal Habitat studies costing a total of $5,168,000 (not including analytical costs). Costs for the 1991 Coastal Habitat Study are comparable to those for the 1989 Coastal Habitat Study (Costs for 1989 and 1990 were $5,440,000 and $9,269,700, respectively).

The major focus of the first study is to select study sites based on a purported stratified random design (completed in 1990) and to comprehensively study the chemical and biological condition of the intertidal, supratidal, and subtidal (moved to subtidal for 1991) zones of each study site. The second study will provide a comparison of hydrocarbon residues in mussels and sediments collected in monitoring programs in Prince William Sound prior to the spill with those in mussels and sediments collected since the spill.

There is compelling evidence that the cost of the Coastal Habitat program, totaling almost $20,000,000 through the 1991 program, is grossly disproportionate to restoration costs. The Trustee Council's own studies of shoreline recovery and restoration show there are no practical approaches to restoration which will outpace nature's own rapid recovery. Widespread restoration is unwarranted as evidenced by NOAA's observation in its 1990 Shoreline Monitoring Program[1] that "Evidence of intertidal recovery was observed at all impacted sites." Moreover, even in specific situations, restoration opportunities are limited by feasibility or are meager in scope. The Trustee Council's 1990 attempts to reestablish rockweed and fauna were proven infeasible, as discussed in the 1991 Restoration Plan and the only restoration planned for 1991 is planting of beach wildrye grass costing $180,000. This certainly does not support research of the scope and expense envisioned by the Coastal Habitat program.

<u>The studies ignore the positive state of ecological health and recovery evident throughout the intertidal communities.</u>

Observations and available information have consistently demonstrated that the flora and fauna of the intertidal communities of Prince William Sound and the

Gulf of Alaska are healthy and thriving throughout the oil-impacted areas. A NOAA report[2] documents that "even where there is direct contact with weathered oil, intertidal organisms have shown remarkable recovery." Given the preponderance of positive evidence, and the Trustee Council's own results from their shoreline restoration feasibility studies, there is no justification for further intensive scientific study as planned in the Coastal Habitat program.

The studies lack a restoration focus.

These specific Coastal Habitat Studies do not address either the identification of or the selection of resource restoration options. However, separate restoration studies are assessing the "feasibility" of restoring these resources. These two study areas appear to be independent of one another, with neither providing the required justification for restoration.

Continued exposure pathways to EVOS hydrocarbons alone will be difficult to establish and document.

The studies fail to describe how EVOS hydrocarbons will be distinguished from other natural and/or anthropogenic sources of hydrocarbons. The recovery of oiled shorelines was monitored by Dr. E. H. Owens since 1989. In spite of focussing on a set of study sites which were biased toward worse-case conditions, Owens[3] found:

> "The combined result of treatment and natural cleaning was that the majority of shorelines retained little or no oil by the end of the summer of 1990 . . . The combined average surface oil cover area of all the Prince William Sound study sites dropped drastically between May 1989, from 46 percent of the total observed area to less that 2 percent by September 1990."

Historical mussel contamination data for Prince William Sound will not be useful for injury assessment.

The Plan proposes the continued use of ten historical sites (1970's) to assess potential mussel and sediment contamination. The Plan states these sites are on low-energy, low gradient beaches, often at the head of embayments; therefore, they are not typical of most oiled sites in Prince William Sound which are high-energy. Therefore, differences between the matched pairs (oiled versus reference) could only be used to determine effects at these 10 sites and have no utility in extrapolation to Prince William Sound or the entire spill-affected area as a whole.

In addition, the presence of petroleum hydrocarbons in tissues of sentinel organisms like mussels cannot, by itself, be considered an injury unless it can be demonstrated that these tissue residues are causing biological injury. The NRDA regulations state that an injury must be found before the pathway is sought.

Insufficient information is given to determine if the stratified random design has been properly implemented.

As in the 1989 and 1990 Plans, methods for random site selection are not described. Additional sites were selected nonrandomly in 1990. Addition of these sites may make the entire sampling design nonrandom. This would limit the ability of the investigators to extrapolate results to the entire range of oil spill sites. It is not clear how many of the sites sampled in 1989 are among the sites sampled in 1990. From the limited description, it appears that criteria for selection of control sites may not have been rigorous enough to ensure that they will be comparable to the oiled sites.

Based on the 1990 Plan, it appeared that only one level of oiling (moderate to heavy) would be compared to control conditions, since lightly and very lightly oiled shorelines were eliminated. The Trustee Council's response to these comments contradicted their earlier statements in that they once again claim to

have sampled lightly oiled shorelines in 1990. Further, the claim that all sites were selected according to a stratified random procedure (which includes oiling levels) when "Sites were selected before any oil reached them..." (Appendix D) is inconceivable. Sites could not be correctly placed in strata without knowing the oiling levels.

Since the shoreline treatment procedures have not been considered in site selection, the "responses to varying degrees of oiling and subsequent clean-up procedures" cannot be measured. Extrapolation is further questionable as a result of the lack of randomness mentioned previously.

Insufficient details are provided to justify the technical soundness of the study.

The study description does not provide enough detail to identify the total number of sites sampled in this study, their distribution between control and oiled sites, between Prince William Sound, Kenai Peninsula, and Kodiak Island, or among the five shoreline types. The Plan does not indicate whether any sites were sampled more than once in 1990, or how many sites were sampled in both 1989 and 1990.

Only a general list (table of contents) of methods is provided without details. The number of tide levels sampled at each site is not described. Methods for sampling and analysis of biota and sediments are not given. The four types of tests of biological conditions and community function are not described. It is not possible to ascertain whether all the different types of biological and chemical analyses were performed on samples from all sites.

Because biological and chemical study methods are not described, it is impossible to determine what methods will be used to study natural recovery or to assess the potential need for restoration work. Moreover, there appears to be no plans to assess the effectiveness of potential restoration work, compared to natural recovery.

Sediment studies are not cost effective since they duplicate studies performed elsewhere.

Studies of petroleum hydrocarbon concentrations in the sediment are part of both Studies CH1A and CH1B. It is unclear whether this represents duplication of effort or whether the results from the different studies will be used to address different components of injury determination.

References

1. National Oceanic and Atmospheric Administration. "Exxon Valdez Shoreline Monitoring Program: 1990 Results" Pentec Environmental, Inc. and Environmental and Energy Service Co. Released April 9, 1991, in Washington, D.C. by NOAA.

2. National Oceanic and Atmospheric Administration. "NOAA Review of Status of Prince William Sound Shorelines Following Two Years of Treatment by Exxon." In: March 15, 1991, letter to RADM D. E. Ciancaglini by D. M. Kennedy.

3. Owens, E. H. (Senior Consultant, Woodward-Clyde). "Changes in Shoreline Oiling Conditions 1-1/2 Years after the 1989 Prince William Sound Spill." Seattle, Washington: Woodward-Clyde; 116 pp.; March, 1991.

Study Title: **COMPREHENSIVE ASSESSMENT OF INJURY TO COASTAL HABITATS**

Study Number: **COASTAL HABITAT STUDY NUMBER 1A** **Study Cost**: **$5,100,000**

This study attempts to document and quantify injury to intertidal, subtidal, and supratidal biological resources in Prince William Sound and the Gulf of Alaska. Samples are to be gathered for chemical and biological analysis from sites characterized as randomly and nonrandomly selected.

Study Objective(s)

PHASE I - Site Selection

This phase is apparently completed, however the following concerns still exist.

Objective 1. Insufficient information is provided to determine if a statistically valid site selection strategy was developed.

Objective 2. No criteria are provided to understand how potential study sites were "ground-truthed", ie, checked to see whether sites actually meet selection criteria. No information is provided on the physical or biological attributes used in selecting sites.

Objective 3. The criteria used to select the 57 1991 sites, apparently carried over from 1989, are never described. It is not clear if the same criteria were used to select sites in 1989 and 1990.

PHASE II - Injury Determination

Objective A. The study plan provides only a general list (table of contents) of methods used to estimate the quantity, quality, and composition of trophic levels. None of the methods used for injury determination are described in sufficient detail to determine the technical soundness of the program.

Objective B. None of the methods used to determine hydrocarbon concentrations in sediment and tissue samples are provided. Insufficient details are provided in the Technical Services Section or the Appendices to evaluate these methods.

Objective C. It will not be possible to establish the response of biological and chemical parameters to varying degrees of oiling and subsequent clean-up procedures when "Sites were selected before any oil reached them and prior to shoreline treatment." (Appendix D-117). This statement verifies the concerns expressed in 1990 on the lack of sufficient information on the methods used to randomly select sites for the stratified random sampling study. Furthermore, none of the Trustee Plans (1989, 1990, or 1991) consider shoreline treatment procedures in site selection for the stratified random study.

It will also not be possible to objectively extrapolate biological and chemical response observed at two levels of oiling (moderate-heavily oiled and unoiled) to all oiled areas of PWS. The approach of eliminating very lightly and lightly oiled sites from study in 1990 and 1991 biases the study towards the "worst-case" scenario. Any differences in biological or chemical parameters measured at these sites apply only to moderate-heavily oiled sites.

Additional bias may be introduced through the use of non-randomly selected control sites as part of the stratified random sampling study. Any differences found in biological response or recovery might simply be artifacts of non-random site selection.

Objective D. It will not be possible to extrapolate possible impact results to the entire spill-affected area because all control sites may not have been randomly selected; lightly oiled sites were eliminated, moderately oiled sites were combined with heavily oiled sites, and none of the statistical procedures needed to detect differences are described.

Objective E. Estimation of recovery rate requires several site visits over time. The CH1 study plan does not define how many sites were sampled in both 1989 and 1990, nor does it define what was meant by "Several samplings per year

..." as stated in the Response to Public Comment. In addition, the study does not define how natural seasonal changes will be handled for estimating impact/recovery, or even what parameters will be used to predict recovery rate and their potential for restoration.

Objective F. It is not clear how this objective will be met since linkages to other studies are never discussed in the plan.

Field Methods

Insufficient details were provided to describe the 57 sites chosen for study in 1991; for example, their general geographic regions, specific locales, oiling level and habitat type were not provided. It is also not possible to tell how many of these sites were sampled in 1989 or in 1990.

Although the study purports to use an SRS design, neither the 1989 Draft Plan nor the 1990 Plan describes the methods for random site selection, even though this was pointed out to the Trustee Council in 1989 and again in 1990.

The study plan does not address QA/QC of biological samples, field methods or taxonomy.

Analytical Methods

Insufficient information is provided to determine whether the analytical methods are based on standard and widely accepted techniques. The study plan provides only a general list (table of contents) of field and laboratory biological methods with no details. None of the methods for the sampling and chemical analysis of biota and sediment are named, described, or referenced. Further, the study plan does not address QA/QC of biological samples, field methods or taxonomy.

Injury Determination Methodology

No information is provided on the statistical methods which will be used to determine injury, or how it is planned to extrapolate from specific SRS sites to the universe of all possible sites in a given category. Also, the study does not address either the identification or selection of restoration options.

It is unlikely that CHIA will result in an objective quantification of injury and subsequent recovery since lightly oiled shorelines were eliminated from study, and moderate and heavily oiled shorelines were apparently combined into one oiling category for the SRS study.

The study does not address how the confounding effects of varying oiling levels, treatment/cleanup effects, and physical environmental factors will be treated.

Study Title: **PRE-SPILL AND POST-SPILL CONCENTRATIONS OF HYDROCARBONS IN SEDIMENTS AND MUSSELS AT INTERTIDAL SITES WITHIN PWS AND THE GULF OF ALASKA**

Study Number: **COASTAL HABITAT STUDY NUMBER 1B** **Study Cost:** **$68,000**

Study Objective(s)

Objective A. None of the laboratory methods for analysis of tissue and sediment samples are provided.

Objective B. Insufficient information is provided to determine whether the laboratory analysis methods used to collect the 1977-1981 data are the same as those used in 1989-1990. No information is provided on how differences measured over time can be attributed to the oil spill rather than to natural or other anthropogenic changes.

Objective C. Although this study may establish differences between specific oiled and unoiled sites, it will not be possible to extrapolate measurements from nonrandomly selected sites to the universe of all sites.

Field Methods

The historical mussel and sediment data were collected at ten nonrandomly selected sites which were not representative of the shoreline in PWS or the western GOA (all low energy, low gradient beaches located at the head of the embayments). Furthermore, it is uncertain how many of these sites are in areas affected by the spill. No site selection criteria are provided for the additional ten sites selected after the spill occurred.

The transect selection method is not provided, but is apparently not random. Mussel sample collection along a transect is said to be random, but no description of the selection method is provided. Use of the term random may

refer to photo-documentation method where photos are "... taken every 4 or 8 m along the sediment transect and every 2 or 4 m along the mussel transect ..."; if so, this is not random.

The study plan does not address QA/QC of biological samples or field methods.

Analytical Methods

Insufficient information is provided to determine whether the analytical methods are based on standard and widely accepted techniques. None of the methods for the sampling and chemical analysis of biota and sediment are named, described, or referenced. Further, the study plan does not address QA/QC

Injury Determination Methodology

Insufficient information is provided on the statistical methods which will be used to determine injury. The study also does not address either the identification or selection of restoration options.

APPENDIX - SECTION F

DETAILED COMMENTS ON

SUBTIDAL SEDIMENTS STUDIES

F. SUMMARY COMMENTS ON SUBTIDAL RESOURCES INJURY ASSESSMENT

The 1991 Plan proposes seven subtidal studies (total cost $1,938,500 excluding analytical costs) with the overall objective of "documenting the geographical extent, persistence, and toxicity of the EVOS oil in [the subtidal] environment and examining effects on select marine organisms." These studies attempt to document changes in the benthos that might be attributed to the EVOS, and to extrapolate those findings to the PWS/GOA region as a whole. However, quantifying these changes, demonstrating their significance, and documenting their causes can not be realized in the current design of the program. Confounding variables include the extreme natural variations of benthic communities, site characteristics, climatic conditions, and the level of oiling.

Studies continue to ignore the obvious indicators of natural recovery and overall ecological health.

Several of the subtidal studies (SS5, SS6, and SS7) focus on the determination of possible injury to fish and shellfish populations due to exposure to subtidal hydrocarbons. However, no mention is made of the highly successful 1990 and 1991 fisheries (salmon and herring) nor of the positive findings of the subsistence sampling program[1] jointly conducted by NOAA, ADF&G and Exxon which provide convincing evidence that fish from throughout the spill-impacted area do not contain hydrocarbons above normal background levels. Further, no problems were found to exist with shellfish, except for those collected from the very few obviously oiled areas. Even then, the risks of consumption, if any, were found to be extremely low. In this context, the continued search for presumed injury to fish and shellfish populations due to exposure to subtidal EVOS hydrocarbons is unwarranted.

Study design is flawed because of inadequate site selection.

This same criticism was documented in ESC's comments on the 1990 Plan and is still true of the 1991 studies. In its previous comments ESC pointed out that

the extrapolation of these results to the PWS/GOA region as a whole was impossible because 1) the number of sites was too small and 2) they were selected to maximize the Trustee Council's potential to detect impact (SS1, SS2, SS3, and SS4) rather than on a random basis. In their response to these comments, the Trustee Council basically agreed with this assertion "The study was not designed to enable extrapolation to the entire region. Subtidal benthic systems differ sufficiently so that area-wide extrapolation is not possible." (see Appendix D, p. 123). This is diametrically opposed to the stated intent of three of the 1991 studies (SS1, SS2, and SS4) which is to "document injury level to a large ecosystem..." (p. 187); yet neither the choice of sites nor their number have changed from the 1990 Plan. Hence, the 1991 subtidal studies will be unable to achieve their desired objective.

Studies fail to establish and document an obvious pathway for exposure.

The analytical methods described for the detection of PAH metabolites in tissue (SS6, SS7) are too imprecise or non-specific to conclusively establish a causal relationship with any EVOS oil in subtidal sediments. For example, the fish bile PAH metabolite analysis methods described for SS7 are not source-specific. Concentrations of metabolites in bile have been shown to vary with recent feeding behavior. Aryl Hydrocarbon Hydroxolase (AHH) activity in liver and cytochrome P-450IA1 are also responses that can be due to exposure to any number of natural factors and/or anthropogenic contaminants other than petroleum. The time lag inherent in detection of metabolites in bile and, to a greater extent, enzymatic activity in liver, confounds any attempt to correlate exposure to effect. Analysis of stomach contents and sediments for hydrocarbons to document exposure is of dubious value for more mobile species.

Studies fail to recognize other factors responsible for change.

Subtidal soft-bottom benthic communities are complex, and faunal composition varies dramatically even at very small spatial scales. Annual variation in recruitment of species is also very high. As a result, variances obtained from surveys such as this are high. Furthermore, none of the descriptors of

community composition mentioned (diversity indices, clusters, rankings, dominance curves and distributions of abundance) behaves in an unequivocal way in response to pollution. (SS2)

Studies are clearly research oriented.

The study of oxidation-products (SS4) is research oriented and not compensable under the DOI regulations. There is no basis in the literature for quantitatively relating oxidation products/metabolites to parent hydrocarbon compounds. Furthermore, because many of the oxidation products are thermally unstable, GC/MS may not be an appropriate analytical tool.

References

1. U.S. Food and Drug Administration. "Report of the Quantitative Risk Assessment Committee: Estimation of Risk Associated with Consumption of Oil-Contaminated Fish and Shellfish by Alaskan Subsistence Fishermen Using a Benzo[a]pyrene Equivalency Approach." Advisory Opinion on the Safety of Aromatic Hydrocarbon Residues Found in Subsistence Foods that were Affected by the Exxon Valdez Oil Spill. Submitted to the Alaska Oil Spill Task Force by the U.S. Food and Drug Administration, Center for Food and Applied Nutrition, Washington, D.C.; August 9, 1990.

Study Title: HYDROCARBON EXPOSURE, MICROBIAL AND MEIOFAUNAL COMMUNITY EFFECTS

Study Number: SUBTIDAL STUDY NUMBER 1 **Study Cost: $434,800**

This is a two part Fates and Effects study whose sole purpose is to collect samples for chemical and microbial analyses in support of other subtidal studies. Part one will attempt to determine the location of and estimate the amount of crude oil currently contained in the subtidal sediments of PWS and the GOA that came from the Valdez spill. Part two will, by means of microbial assays, attempt to measure the amount of spilled oil contained in the subtidal sediments that is bioavailable. These data are to be used to assess injury to benthic communities (Subtidal Study Number 2).

Study Objective(s)

Serious fundamental deficiencies in the study will prevent it from achieving its primary objectives.

Fates:

- Inclusion, in the 1991 mass balance calculations, of data from sites sampled in 1989 and 1990 is invalid because of temporal changes that have taken place, especially in the nearshore subtidal, where wave action and currents are most active.

Effects:

- The microbial hydrocarbon oxidation potential assays will respond to total available hydrocarbons; i.e., those from background hydrocarbons and those from any spill oil if it is present. Except for heavily oiled samples, it will not be possible to establish a causal relationship that differentiates responses due to background from those due to small amounts of oil.

Study findings will not lead to the identification and selection of meaningful restoration options.

Field Methods

The number of 1991 PWS study sites (20; 10 reference and 10 "contaminated") is insufficient to calculate the amount of oil remaining from the spill that might currently be present in the subtidal sediments of the Sound for mass balance models.

The number of stations to be sampled in the 1991 program is inadequate to map "...the geographic and bathymetric distribution of hydrocarbon contamination of sediments in PWS and the northeastern GOA."

The sampling sites were not randomly selected. Consequently, the results apply only to those sites and it will not be possible to extrapolate results to the Sound for the purpose of "documentation of injury level to a large ecosystem."

Analytical Methods

The use of data from "sediment samples collected for 12 studies in the NRDA process.." to construct maps mixes variables for the reason given above. Time can only be shown on a sequence of maps, and there are too few data points in any single time window for any meaningful map to be generated.

One of the objectives of the data synthesis is to "...test specific hypotheses about the distribution of Exxon Valdez oil in sediments throughout the study area." This is extremely vague as specific tests and hypotheses are not given.

The mathematical methods for estimating maximum potential for in situ biodegradation and for discriminating effects caused by oiling from other factors are not given. Considering the small number of sites and the number of confounding variables that can not be controlled, it is extremely doubtful that study objectives can be realized.

Injury Determination Methodology

Nowhere in Subtidal Study Number 1 is there any attempt to identify injury, the cause of injury, or significance of injury. The link between the microbial assay results, chemical analyses of the extracted hydrocarbon fraction, determination of a Valdez component in that fraction, and "changes" noted in subtidal infaunal communities associated with eelgrass and Laminaria beds (SS2) is never made.

Study Title: INJURY TO BENTHIC COMMUNITIES

Study Number: SUBTIDAL STUDY NUMBER 2 **Study Cost: $592,500**

This is a proposed five-year program to study both shallow and deep benthic communities at the same oiled and control sites as Subtidal Study Number 1 in an attempt to determine the "temporal and spatial effects of the EVOS..." at those sites. Quantification of injury to the deep benthos at those sites is to be attempted by examining "...the relationship between the accumulation and retention of hydrocarbons in sediments and the effect on the benthic biota." "Effects" are defined as "changes" in the "richness and diversity, general abundance and biomass, and the trophic composition of benthic biota at stations within oiled and unoiled bays..."

Study Objective(s)

Subtidal soft-bottom benthic communities are complex, and faunal composition varies dramatically even at very small spatial scales. Year-to-year variation in recruitment of the many species usually represented is also very high. As a result, variances obtained from surveys such as this are expected to be high. Consequently, the chances of detecting changes clearly attributable to EVOS are minimal. None of the descriptors of community composition mentioned in the Study (diversity indices, clusters, rankings, dominance curves and distributions of abundance) behaves in an unequivocal way in response to pollution. It will be virtually impossible to establish a causal relationship between oil pollution and observed changes in the composition and abundance of the macro-infauna.

This study focuses largely on basic scientific inquiry and research and is only minimally directed towards quantification of injury for the purposes of restoration planning.

Field Methods

Site selection is fundamentally flawed and reflects a limited understanding of hydrology and oceanography. Volume of freshwater input, as defined by drainage basin characteristics, is more important than "proximity to sources of freshwater." More importantly, the paired sites selected do not come close to meeting the design criteria. For example, the aspects (direction the bay faces) and wave exposure of Bay of Isles and Drier Bay, Herring Bay and Lower Herring Bay are very different. Water circulation patterns, bathymetry and other physical characteristics of paired sites are often markedly different.

Because site selection is flawed, the stratified sampling design for those sites has little meaning. The number of confounding variables beyond oiled versus control is so great that it will be impossible to discriminate the effects of any EVOS component in the sediments from other variables with any degree of confidence or credibility.

A five-year program to collect these data, clearly research, is not justified in the NRDA process. No justification is given which would indicate that continued study and expenditures of the magnitude proposed are cost effective based upon a demonstratable degree of injury and associated restoration needs.

The study design is deficient. The objectives cannot be achieved for a number of reasons. For example, the number of oiled/control pairs is inadequate to include site variability and differences in the level of oiling in assessments of benthic communities. Variables other than the presence or absence of oil at the sites (for example, aspect and wave exposure) will preclude attempts to relate detected "changes" to the presence of weathered oil in the subtidal sediments.

Further, sampling is not based on the statistical methodology to be used in the numerical analysis. In fact, the investigators seem uncertain as to the statistical tests to be employed.

Analytical Methods

As in the 1989 Draft Plan and 1990 Plan, insufficient details are provided to evaluate proposed analytical methods. For example, the procedure for calculating "approximate carbon values for all wet-weights..." of the various taxonomic groups is not described. Contrary to what is stated in the Plan, the "methodologies, rationale, and problems with the use of diversity indices, K-dominance curves, and geometric abundance as measures of pollution-induced disturbance..." are not discussed in Appendix C.

Also, because so few sites are to be sampled (2 stations in each of 7 oiled and 7 unoiled bays) the potential for using multivariate statistics is minimal. The degrees of freedom will be too easily exceeded - especially for estimating oiled/control differences.

Injury Determination Method

Neither the cause of any alleged injuries nor their significance will be established by this study.

The method of injury determination is to detect "changes" in benthic communities between oiled and control bays that can be attributed to the oil. Because a) the number of sites to be studied relative to the degrees of freedom is small, b) the selection of control sites was not implemented according to the design criteria, and c) no baseline benthic community data exist for the study sites to document prespill conditions, it will not be possible to attribute detected "changes" due to the presence of spill oil with any reasonable degree of confidence. Thus, this study represents a waste of resources and is of questionable merit.

This study cannot, by its design, not lead to any meaningful quantification of injury. Further, it has no value in terms of assessing the need for, or feasibility of, a restoration plan in areas which may be shown to be injured.

Study Title: BIO-AVAILABILITY AND TRANSPORT OF HYDROCARBONS

Study Number: SUBTIDAL STUDY NUMBER 3 **Study Cost: $346,000**

This study attempts to measure injury to the water column and subtidal sediments by using mussels as a surrogate for direct water column analysis and using sediment traps for particulate-transport to the subtidal.

Study Objective(s)

The objectives do not state any testable scientific hypotheses but rather state broad topics which do not clearly relate to EVOS injury assessment.

Objective C. Use of sediment traps is a flawed method, a waste of resources, and a duplication of the direct sampling of the subtidal sediments described in Subtidal Study #1. Sediment traps are not appropriate for determining particulate transport of hydrocarbons in shallow-water environments because of the few sites sampled, the highly variable circulation patterns, and the shallow water conditions. Because the only purpose of these traps is "to show the presence or absence of adsorbed hydrocarbons" merely sampling the subtidal sediments would suffice.

Field Methods

Mussel cages are to be deployed at ten sites, eight of which were "subject to maximum original oiling." This will not give a representative picture of bio-availability in the spill impacted area. The temporal trends noted will be site-specific and not applicable to an area-wide extrapolation.

Analytical Methods

No procedures are described which will differentiate EVOS oil from other potential sources of absorbed hydrocarbons in mussels and sediments. How the

bottom cores will be analyzed, or how the data will be used with that collected from the sediment traps, is not mentioned in the Plan.

Injury Determination Methodology

This study lacks relevance to injury determination and natural resource restoration. Consequently, the study cannot be deemed cost-effective.

Because of the highly biased sampling design in the caged mussel study, the data will only be appropriate to the sites sampled and not useful for injury determination.

The sediment trap element of this study will yield little, if any, useful information for injury determination. The claim that coordination with other studies will allow "...result extrapolation both spatially and temporally..." is simply not valid. All of these subtidal studies are concerned with specific nonrandomly chosen sites and are therefore not useful for an area-wide extrapolation.

No information is provided which documents the significance of either suspended caged mussel uptake or suspended sediment sorption of hydrocarbons to EVOS damage assessment. Neither of these techniques can be related in a meaningful way to in situ exposure of natural resources to biologically available EVOS hydrocarbons, much less establish some degree of injury resulting from possible exposure.

Study Title: FATE AND TOXICITY OF SPILLED OIL FROM THE EXXON VALDEZ

Study Number: SUBTIDAL STUDY NUMBER 4 **Study Cost: $125,000**

This study attempts to conduct toxicity tests of sediment using Ampelisca and Crassostrea. Oxidation products of oil-weathering would be quantified at selected sites and their toxicity assessed. A mass balance of the spilled oil would be hypothesized using results from the various studies.

Study Objective(s)

Objective A. Site-selection criteria for toxicity tests are not specified, and apparently nonrandom. Attempts to extrapolate toxicity results to the area will not be meaningful.

Objective B. Determination of toxicity of fractionated extracts is not representative of true bio-availability and exposure. The results will be of little or no use in determining injury.

Objective C. It is not clear how this study will use information from the other studies and if methods are available to differentiate EVOS crude from other hydrocarbon sources. Because most of the sources of information involve data from nonrandomly-selected sites, a representative mass balance estimate is not achievable.

Field Methods

Because sample sites are chosen to represent "the more heavily oiled areas" the results will not be representative of the general condition of Prince William Sound. Further, specific sampling sites are not identified and adequate information is not provided to ensure that other variables will not interfere with interpretation of toxicity results.

Analytical Methods

As in the 1989 and 1990 Trustee plans, insufficient details are provided for the evaluation of proposed analytical methods. Also, it is doubtful to what extent the toxicity of sediment samples can be attributable to the EVOS component (if any) of sediment.

The study of oxidation products is research oriented and not appropriate for NRDA. There is no basis in the literature for quantitatively relating oxidation products/metabolites to parent hydrocarbon compounds. Furthermore, analytical protocols for oxidation product separations are not specified. Because many of the oxidation products are thermally unstable, GC/MS may not be the appropriate analytical tool.

Constructing a hypothetical mass balance of the spilled oil is subject to considerable error. The result of this component of the study will have no bearing on the NRDA objectives of injury quantification and selection of restoration options and, consequently, this study is is not an appropriate NRDA activity.

Injury Determination Methodology

Other than site-specific assessments, none of the toxicity or oxidation product data will be useful in the overall quantification of resource injury.

Because of the inherent imprecision of a "fate" model coupled with the site-specific sampling designs of the NRDA studies, the efforts to mass balance the spill will have little or no utility in injury determination.

Study Title: INJURY TO PWS SPOT SHRIMP

Study Number: SUBTIDAL STUDY NUMBER 5 **Study Cost: $50,000**

This study attempts to evaluate possible injury to spot shrimp populations by developing comparisons of abundance, size distributions and reproductive potential between previously oiled and unoiled sites within Prince William Sound. Field collection methods include the use of commercial shrimp pots. Measurements of sex, length, weight, and reproductive state will be made and tissues will be sampled for hydrocarbon concentrations.

Study Objective(s)

Objective D. The Plan states that the study will "test the hypothesis that the level of hydrocarbons [in tissues and eggs] is not related to the level of contamination at a site." However, in Appendix D it was stated that "No attempt was made to document the degree of oiling" at study sites. This indicates a lack of consistency.

Objective E. The Plan states that the study will "document injury to tissues and compare differences between oiled and unoiled sites." The methods section of the Plan does not describe how this will be conducted.

Field Methods

Selection of study areas is clearly inappropriate. Locations for the two treatments (oiled, unoiled) to be compared are geographically grouped in southwest and northwest PWS respectively. Because of inherent differences between these two areas, no meaningful conclusions regarding EVOS can be drawn from differences measured in this study.

Insufficient information is provided to document that selected control sites are sufficiently similar to test sites in terms of baseline production of

shrimp to serve as proper comparisons. Other environmental factors will affect the results. For example, historical ADF&G commercial fishery catch data (Donaldson, 1989) indicate a marked decline in pot shrimp stocks prior to the spill in statistical areas 201-00 and 201-02 which encompass three of the four oiled test sites. No information is given regarding how this non spill-related effect on the '89 year class will be accounted for.

Insufficient information is provided to document how seasonal migration of shrimp from shallow to deep water will be considered especially since mixing of populations between oiled and unoiled areas needs to be isolated from such seasonal effects. Similarly, larval mobility into/out of potentially injured areas is not well understood and will not be documented in the context of this study.

Test sites identified as "oiled" (Herring Bay, Chenega Island, Green Island Elrington Passage) describe large areas with varying degrees of actual exposure to floating and stranded oil. Insufficient information is provided regarding the criteria for selecting impact and control sites and how the sites within these areas will be documented with respect to the specific level of oiling or degree of exposure. Volume II, Appendix D indicates that sites are classified only as oiled or unoiled based upon observations of surface oil. This cannot lead to quantification of injury based upon a spectrum of exposure levels in time and space.

The sampling gear described as commercial shrimp pots is designed to catch adult shrimp of commercial market size and is inadequate for achieving the stated objective of determining "whether the 1989 year class suffered a high mortality rate in areas of high oil impact relative to other year classes" in the 1990-91 study year. In the 1991 study year, shrimp of the 1989 year class will yet be juveniles only partially captured by the gear and not quantifiable in a statistically meaningful way.

The statistical design of the study is flawed. Aside from tissue hydrocarbon measurements, no information is given as to what statistical techniques will be applied for attributing differences to oil and what levels of effects will be

tested for. Sampling effort may not be appropriate to meet objectives. Use of ANOVA to analyze catch data appears inappropriate due to non-normality of catch data, violation of the independence assumption, and failure to address the dual-level sampling design.

Study design of sampling pot strings of 11 pots per station is systematic, not random. Subsequent analysis of pot catch data seems to assume that all pots are independent. The validity of this is questionable.

Analytical Methods

No information is given which describes how EVOS-related hydrocarbons will be distinguished from other hydrocarbons in analysis of shrimp tissue and egg samples. Absence of environmental exposure data negates documentation of a pathway and a causal link between EVOS and differences in abundance, size distribution, fecundity, etc.

Injury Determination Methodology

Inadequate information is provided to determine what statistically significant differences will be detectable within the study design. The stated objectives and methods do not indicate that the study will lead to an objective quantification of the baseline condition of the resource, the level of injury, the variance in the degree of injury in space, the length of time over which injury will persist, or the likelihood and rate of recovery.

Focus of this study on the 1989 year class precludes documentation of prespill baseline conditions for pot shrimp captured by the gear and negates the possibility of this study distinguishing spill effects from natural differences between test areas.

Based upon evidence of a pre-spill bias between oiled and control areas which will influence the results of this study, this study is directed at resource management rather than bonafide injury assessment. As such, it is inappropriate for NRDA purposes and is not compensable.

Study Title: **INJURY TO DEMERSAL ROCKFISH AND SHALLOW REEF HABITATS IN PWS AND ALONG THE LOWER KP**

Study Number: **SUBTIDAL STUDY NUMBER 6** **Study Cost:** **$120,000**

This study attempts to evaluate injury to rockfish and their habitat by assessing levels of hydrocarbons in sediments, food organisms, and rockfish bile in reef habitats in Prince William Sound and the lower Kenai peninsula. Methods include sampling at eight sites with associated hydrocarbon concentration measurements in stomach contents, tissues, prey organisms, filter feeders and sediments.

Study Objective(s)

Objective C. "Determine the feasibility of using otolith microstructure to evaluate depressed growth as a result of oil contamination." This is an experimental technique.

Field Methods

Sampling locations are not adequately identified. The appropriateness of sampling sites as controls and test sites cannot be evaluated, particularly with respect to the influence of other important variables, including alternate sources of hydrocarbons. The degree to which test sites are representative of the entire resource cannot be assessed.

Sampling design is inadequately addressed. Resulting data will be of a semiquantitative nature, at best. Sampling of reefs in water shallow enough to be accessible to divers (< 20 fathoms) biases the outcome.

The level of effect due to EVOS which will be tested for, and the probabilities of making type I and type II errors, are not specified with respect to

experimental design, sampling strategies and statistical significance. The appropriateness of sample sizes specified cannot be evaluated. It is not explained how sources of confounding variability (geographic and reef communities) will be handled in the analysis. No information is provided regarding how samples for hydrocarbon analysis will be handled and preserved in the field to ensure that sample quality and integrity are maintained until analysis in the laboratory.

Analytical Methods

Determination of the presence or absence of EVOS hydrocarbons in demersal rockfish (Objective A) cannot be accomplished by analysis of bile, which is nonspecific to hydrocarbon source and may be subject to interference by other compounds. This technique is not applicable in studies where identification of parent compound source is essential. Identification of EVOS hydrocarbons by tissue analysis is also questionable due to the efficient, and possibly selective, metabolic functions in fish, as well as the possible occurrence of non-EVOS hydrocarbons.

Inadequate information is provided regarding specific techniques for the determination of hydrocarbons in sediments and tissues. There is no information regarding how "contamination" will be defined and determined.

It is not clear how descriptions of otoliths are to be interpreted. Inadequate information is provided to determine how otolith derived age composition and mean length-at-age data are to be used for natural resource damage assessment.

Injury Determination Methodology

While the study attempts to evaluate the occurrence of hydrocarbons in the habitat sediments and food chain, it is questionable whether a clear link between injury to resources and the EVOS can be established.

The study appears to be poorly controlled and designed, as well as inherently biased. It is not among the stated objectives, nor tacitly implied in the methods, that this study will result in quantification of injury to resources. The study objectives are split between simply attempting to document exposure (tissue and bile hydrocarbons, enzyme activity) and identifying aspects of damage (absence of fish, pathological conditions, embryo development), and there is no indication that injury will be assessed beyond testing the statistical significance of observed differences. There is no indication that injury due to EVOS can be distinguished from other non-EVOS related differences. There is no clear relationship between the parameters studied and the level of service provided by the resource.

Study Title: **ASSESSMENT OF OIL SPILL IMPACTS ON FISHERY RESOURCES: MEASUREMENT OF HYDROCARBONS AND THEIR METABOLITES, AND THEIR EFFECTS**

Study Number: **SUBTIDAL STUDY NUMBER 7** **Study Cost:** **$315,000**

This study attempts to evaluate possible injury to several species of fish inside and outside Prince William Sound. Measurements will be made at 14 sites of a broad spectrum of biological and biochemical parameters to assess possible degree of exposure to EVOS and the resultant effects.

Study Objective(s)

This study is microscopically and academically focussed. It ignores the very apparent good health of fish populations in PWS and focuses on biochemical indicators which afford no direct link either to EVOS or to actual resource injury.

Objective A. It is stated that "representative sediment samples will be taken from each sampling site for subsequent chemical analysis." No sampling description is provided to ensure that the sediments will be adequately sampled to represent a given area.

Objective B. The techniques described cannot distinguish between metabolites resulting from EVOS hydrocarbons and other petroleum hydrocarbons in the large and diverse area described for study.

Objective C. Analysis of enzyme induction is subject to the same interferences as described for objective B.

Objective G. The general lack of baseline data in the literature for pathological incidence, mortality and fecundity for these species in the study

area casts considerable doubt on the validity of any input data used in a simulation model.

Field Methods

The effects of oiling, location and time are confounded. It may be impossible to determine if a statistically significant effect was due to EVOS or to natural variation due to time, location, or alternate sources of hydrocarbons.

Some of the fish species to be sampled/analyzed have great mobility and low fidelity to the collection site. How their geographic range can be accounted for in assessing the significance of apparent exposure is not adequately described.

Analytical Methods

The analytical methods described are not specific for the source of the hydrocarbons which may be metabolized. Similarly AHH activity in liver and measurement of cytochrome P-450IA1 are not specific to hydrocarbons but may indicate a response to any number of natural and anthropogenic contaminants. A direct, causal link to EVOS cannot be established using these techniques.

Concentrations of metabolites in bile have been shown to vary with recent feeding behavior of the fish. There is no indication in the methods that this source of variability can be accounted for.

The time lag inherent in detection of metabolites in bile and, to a greater extent, enzymatic activity in liver, will frustrate any attempt to correlate exposure to effect. Analysis of stomach contents and sediments for hydrocarbons to document exposure is of dubious value for more mobile species.

Reproductive impairment is to be assessed on two species; Pollock (pelagic) and Yellowfin sole (shallow subtidal). There is no documentation offered that these

species either a) represent the total finfish population, or b) constitute dominant species in the finfish resource.

Injury Determination Methodology

There is no basis for equating the indicators measured (bile metabolite concentrations, enzymatic activity) with biological resource damage. The methods section states that "injury will be determined using statistical and simulation models which will be developed as part of these proposed studies." These models clearly have not been validated if they have not yet been developed.

APPENDIX - SECTION G

DETAILED COMMENTS ON

TECHNICAL SERVICES

G. COMMENTS ON TECHNICAL SERVICES AND APPENDICES A AND B

The 1991 Plan proposes technical services in two areas that are designed to support the assessment studies. Hydrocarbon analytical services, budgeted at $2,550,000, includes generation, archival, and retrieval of all analytical chemistry data. The mapping services, with a cost of $956,300, include implementing and managing a geographic information system to archive and process data collected in NRDA studies. Histopathology services have been dropped in 1991 as a separate technical service. Histopathology samples and analyses are being handled within specific NRDA studies.

Insufficient details provided for review.

The 1991 Plan is little changed from the 1990 Plan. As with the 1990 Plan, the 1991 Plan contains insufficient details for full and complete technical review. For example,in Technical Services Study 1 (TS1) and Appendix A, sufficient information is still not given to allow complete evaluation of the analytical methods, or the adequacy of the number of samples analyzed. The 1991 Plan does provide a more detailed description of procedures for sample identification and tracking than earlier Plan descriptions. Apparently many NRDA samples were taken and tracked with less effective procedures.

Proposed mapping efforts are unchanged from the 1990 Plan, and are also lacking in detail.

Similarly, the proposed audits of field and laboratory procedures, while somewhat better described in general terms than in the 1990 Plan, are incomplete in details needed to justify their adequacy. Only chemistry audits are mentioned, neglecting key audits of other areas such as sample analysis, biological observations, database input, chain-of-custody, or mapping.

The study design continues to be deficient in many aspects.

Analytical methods for hydrocarbon measurements are still not defined adequately to allow determination as to whether the methods are capable of

distinguishing between low levels of hydrocarbons from EVOS and other natural and/or man-made sources.

The program for measuring hydrocarbon metabolites in bile suffers from a lack of standards or reference materials. While these bile analyses are called "semi-quantitative", in the absence of definitive standards, they may easily give results leading to erroneous or misleading interpretations of low-level responses that cannot be identified as to precursor hydrocarbon structure or origin.

The Quality Assurance plan may discard valuable, perhaps irreplaceable data.

The QA plan for chemical analyses in TS1 and Appendix A states that "Unacceptable performance [in the intercalibration exercise] will result in the discarding of the associated data." This vaguely worded criterion was also present in the 1990 Plan. Concern remains that application of such intercalibration criteria, after samples have already been analyzed by a laboratory, could result in discarding relevant data and biasing results. Under these conditions all data should be reported with appropriate qualifications, not discarded.

Volume II of the 1991 Plan addresses ESC's criticism of this point in the 1990 Plan, but only indicates that "the data...[associated with a laboratory failing the intercomparison exercise] ... will be flagged in such a manner that they will not automatically be incorporated into data retrieval." It is still unclear whether any of the data previously analyzed by that laboratory would be discarded, including some meeting QA/QC requirements.

Study Title: **HYDROCARBON ANALYTICAL SUPPORT SERVICES AND ANALYSIS OF DISTRIBUTION AND WEATHERING OF SPILLED OIL**

Study Number: **TECHNICAL SERVICES STUDY NUMBER 1** **Study Cost:** **$2,550,000**

This study serves as a coordination program overseeing all analytical chemistry performed for NRDA programs.

Study Objective(s)

Objective A. Analytical methods cannot be completely and fully evaluated since no details were provided other than a minimum list of compounds, which appears to be calibration standards (Plan wording unclear). If analytical data on a larger list of compounds are being collected, then a full list of target compounds (organic and inorganic) should be provided. If detailed documentation on these procedures has been developed, it should be incorporated in the Plan.

Objective B. Details of the procedures used to assist Project Leaders and field personnel in implementing appropriate sample collection, identification, shipping, and chain of custody procedures are not given. It is therefore impossible to determine if such procedures are adequate or correct.

Objective C. As in the 1990 Plan, it is not clear how the sample labeling plan guarantees "unique" sample numbers across the entire program contained in the 1991 Plan. The detailed sample labeling plan should be provided in the Plan.

Objective D. Data that do not meet standards should not be discarded. If data are not being discarded, but are merely being archived so that they can be retrieved, then the text (Volume I) of the 1991 Plan should be modified. As it stands now, the data appear to be discarded in Volume I, but archived in Volume II.

As in the 1990 Plan, the minimum list of calibration standards provided in the Plan is inadequate for some types of analyses.

Objective F. Constructing a material balance on the fate of spilled oil is a very complex task that is not adequately described in the Plan. Inadequate analytical techniques and biased sampling programs will make this virtually impossible.

Analytical Methods

Details needed for evaluation of the analytical methods were not provided.

The number of samples to be analyzed by various methods is not specified, making it impossible to determine if this is a cost-effective exercise.

As written, the study plan allows for discarding relevant data. The QA plan for chemical analyses in Appendix A states that "unacceptable performance [in the intercalibration exercise] will result in the discarding of the associated data." It is not clear what this means. For example, if the analysis of just one analyte out of the many tested is viewed as "unacceptable", would this invalidate all data from the laboratory or only the low values, near the detection limit? Application of such intercalibration criteria after samples have already been analyzed by a laboratory could result in discarding valuable data and biasing results. Under these conditions all data should be reported with appropriate qualifications, not discarded.

The minimum list of calibration compounds in TS1 is inadequate for alkane analysis. A full list of target compounds should be provided.

Study Title: **IMPLEMENT AND MANAGE A GEOGRAPHIC INFORMATION SYSTEM (GIS) TO RECORD AND PROCESS NRDA DATA**

Study Number: **TECHNICAL SERVICES STUDY NUMBER 3** **Study Cost:** **$956,300**

This technical services study presents plans to produce and disseminate maps and analytical products for participants in the NRDA process. It is also stated that the effort will create and maintain a database pertinent to the overall assessment process in a way that it will be accessible to all agencies. The objectives and methods remain the same as for the 1990 Plan. The same comments and reservations expressed about the 1990 Plan therefore still apply to the 1991 Plan.

Study Objective(s)

Objective 1. As in the 1990 Plan, insufficient information is given regarding the specific types of maps and analytical products to determine if this program will provide products of value in monitoring geographic distributions of data pertinent to assessing injury from EVOS.

Objective 2. The specific objectives as to type of database(s) to be developed, and data organization for the database to be provided are not given other than the mention of a geographic component.

Analytical Methods

Insufficient information is provided to allow determination of adequacy of quality control on data input to the mapping process. No information is provided to show how the data in the mapping database compared to the original data.

No information is provided on statistical treatments used (if any) to average data values for input to the mapping process. For the database quality

control, similar concerns exist. Insufficient information is provided to allow determination of adequacy of the program proposed for quality control of data input.

Injury Determination Methodology

Insufficient information is given to determine if the work will contribute to objective quantification of injury to resources, including assisting in clarifying cause and effect relationships. It cannot be determined from the plan description whether objective "multi-thematic atlases of pre-spill data" exist on the same scale as needed for comparison with post-spill data. It is not possible to determine whether this work will be cost-effective based on the information given.

APPENDIX - SECTION H

DETAILED COMMENTS ON

ARCHEOLOGY STUDY

H. COMMENTS ON DETERMINATION OF INJURY TO CULTURAL RESOURCES

The 1991 Plan has a total budget of $791,600 to identify and quantify the injury to cultural resources by assessing the impacts on soil chemistry, soil structure and inclusions, artifacts, site vegetative cover and stability, and incidences of site theft or vandalism.

This section of the 1991 Plan is unchanged from the 1990 Plan, therefore ECS's previous comments are still valid.

Assessment of cultural resources is not covered by NRDA regulations.

Cultural resources are not natural resources as defined by the NRDA regulations. Therefore, this program should not be funded as part of an NRDA effort.

Insufficient information provided for adequate technical review.

Insufficient information is provided to adequately review and comment on the cultural resource assessment program. This includes objectives and field, analytical, and statistical methodologies.

Resulting information generated by this study is available elsewhere.

Much of the desired information generated from the work described is already available to the Trustee Council. Exxon, as part of its clean-up operations, extensively surveyed the beaches in the impacted area. These surveys, as well as the final reports documenting the identification of sites, are available to the Council. Therefore, the survey and site selection efforts described in the program needlessly duplicate existing information.

Study Title: DETERMINATION OF INJURY TO CULTURAL RESOURCES

Study Cost: $791,600

This study attempts to identify and quantify injuries to natural resources and to develop the foundation for a program to restore and rehabilitate archeological resources.

Study Objective(s)

Objectives A-E. Much of the proposed work, including surveys and site identification, has been performed already and is available to the Trustee Council under ESC's permit obligations.

This Plan does not make it clear why investigations will be made of sites in unoiled areas. Potential site injury is a function of many factors including shoreline type, stratigraphy, location, degree of oiling, cleanup techniques, and artifacts present. Given the uniqueness of individual sites, the range of distribution, and the diversity of time span it is inappropriate to extrapolate these "control sites" to oiled areas.

The cost of this study appears excessive in relation to the small number of documented disturbances to cultural or acheological sites.

Insufficient detail is provided to perform a thorough evaluation.

Field Methods

Notwithstanding the applicability of this study, sufficient information is not provided to evaluate if the methods employed meet the standards and guidelines for archeology and historic preservation per 48 Fed. Reg. 44716-44740, September 29, 1983.

This study does not provide sufficient information to evaluate how the significance of historical properties, topologies, site investigations, impacts resulting from interviews, soil column physical characteristics and analysis, radiocarbon aging of artifacts and vandalism and erosion rates will be determined.

Insufficient information is available to evaluate how oil spill response workers and government employees will be interviewed to ensure no bias is created. Also not provided is information on how results will be used to quantify injury.

Analytical Methods

This study does not provide sufficient information to evaluate if the methods employed meet the standards and guidelines for archeology and historic preservation per 48 Fed. Reg. 44716-44740, September 29, 1983.

APPENDIX - SECTION I

DETAILED COMMENTS ON

ECONOMIC STUDIES

I. COMMENTS ON ECONOMIC STUDIES

The economic studies described in the Trustee Council's 1991 Plan continue to have no apparent relevance to the statutory standards set by the CWA for measurement of damages based on cost of restoration. Indeed, the description of the 1991 economic studies is identical to the description of the 1990 economic studies except for the addition of yet another study (ECON10: Petroleum Product Price Impacts) having nothing to do with natural resource damage assessment.

A fundamental defect of the economic studies in the 1991 Plan is the continued attempt to estimate foregone use and non-use values with no apparent intention of applying the results to the only purpose for which they are legitimately applicable. That sole purpose is the determination of whether cost of restoration is grossly disproportionate to the value of the injured resource or identification of the most cost-effective restoration alternative. The economic studies also continue to be flawed as outlined below.

State economic studies are still not included.

A much-publicized agreement between the federal and state trustees was announced on January 14, 1991. It assured the public that it was finally possible for federal and state parties to work cooperatively on economic studies. Nonetheless, economic studies conducted or planned by the State of Alaska are still not included in the Trustee Council's 1991 Plan. This continues to demonstrate that federal and state studies are not coordinated, a condition certain to inflate assessment costs, further deteriorate study quality, and contribute to additional double counting. This state of disarray is discussed in a letter entitled "Memorandum on Exxon Valuation Issues," prepared by Erickson & Associates for the House Special Committee on the Exxon Valdez Oil Spill Claims Settlement of the Alaska state legislature, dated April 21, 1991. The disagreements which continue to plague the Trustee Council's economic studies are an indication of the primitive and controversial status of

the study methods. Failure to include the state studies in the 1991 plan also severely limits meaningful comments on the federal economic studies.

Inadequate study description is provided.

Except for addition of ECON10 (Petroleum Product Price Impacts) and revision of the title of ECON7, the descriptions of economic studies contained in the 1991 Plan are the same as the 1990 Plan. The description of study objectives and methodology remains insufficient to permit thorough evaluation. Repeated claims (in the Trustee response to comments on the 1990 Plan) that the plans are intended only to "provide notice of the types of economic studies that are being carried out or are contemplated" are totally inconsistent with the terms of applicable regulations. This response also admits that the Trustee Council has no intention of soliciting meaningful review and comment on those studies. Issuance of a 1991 Plan which merely reproduces the study descriptions from previous plans indicates that little or no progress was achieved in prior years in spite of the planned expenditure of $6.5 million ($2.8 million in 1989 and $3.7 million in 1990). The position that "[i]nformation about the status of the previous years' efforts is litigation sensitive" is inconsistent with the DOI regulations concerning PRP's special role in conducting the assessment and with the Ohio court's affirmation of that provision.

Studies to assess noncompensable damages continue to be included.

Most of the economic studies in the 1991 Plan purport to assess alleged damages that are not compensable under the laws and regulations governing natural resource damage assessment. The study to estimate petroleum product price impacts, added to the 1991 plan, is illustrative. Further examples include commercial fisheries losses covered by private claims, alleged research losses, alleged damage to archeological resources, hypothetical effects on value of public land, and others as cited in the individual study critiques.

Studies continue to incorporate substantial double counting.

The economic studies continue to include numerous cases of double counting of alleged damages. Examples include: attempts to estimate non-use losses of natives in three separate studies; attempts to identify changes in property values which include separately measured use value effects; attempts to estimate separately alleged losses in sport fishing and charterboat operations; and inclusion of duplicate non-use values. Although the response of the Trustee Council to comments on the 1989 and 1990 plans recognizes the requirements to eliminate double counting, the economic study plans still make no reference to such requirements and still do not provide methods to properly account for double counting. Revision of ECON7 to attempt to estimate "total value" further exacerbates this problem. If successful, the revised study would produce estimates, however inaccurate, that would clearly double-count alleged damages estimated in ECON5, among others.

Several studies continue to depend significantly on an unproven and controversial method.

Extensive reference continues to be made in the economic study descriptions to use of contingent valuation, a methodology that cannot be applied validly or reliably to assessment of compensatory damages for diminition of non-use values in the circumstances of this case.

Studies are still not integrated.

There continues to be no apparent relationship between the economic studies and the studies of injury determination or restoration planning. Furthermore, there appears to be no coordination among the economic studies as indicated by the degree of double counting and the absence of plans for economic studies undertaken by the state.

Studies continue to include unnecessary data collection.

Many of the economic studies still include expensive efforts (evidently not successfully completed in 1989 or 1990) to collect data which should be available routinely and without cost from government and business sources.

Examples include demand for cruise ship tours[1], subsistence use data[2], identification of research studies under way before the spill, fisheries quantity and quality data[3], and others.

References

1. Alaska Visitors Statistics Program, Alaska Visitor Arrivals: Summer 1989, Department of Commerce and Economic Development, Alaska Division of Tourism, undated.

2. Alaska Habitat Management Guide, South Central Region, Volume II: Distribution, Abundance, and Human Use of Fish and Wildlife, Alaska Department of Fish and Game, Division of Habitat, Juneau, Alaska, 1985.

3. Savikko, H.; Page, T. "1989 Preliminary Alaska Commercial Fisheries Harvests and Values," Regional Information Report No.5J90-7, Alaska Department of Fish and Game, Juneau, Alaska, May 1990.

Study Title: COMMERCIAL FISHERIES LOSSES CAUSED BY THE EVOS

Study Number: ECONOMICS STUDY NUMBER 1 **Study Cost: $265,500**

The 1991 Plan description is identical to the description contained in the 1990 Plan except for deletion of references to "continued exposure to contaminants" in the study introduction and elimination of reference to "Pacific halibut." Trustee Council response to public comment on the 1990 Plan description was confined to (1) claims that the plan is for purposes of public notice only and is not intended to contain useful information regarding study design or progress and (2) vague assurances that available data will be used and double-counting will be avoided. Accordingly, comments submitted on the 1990 Plan remain relevant.

The study continues to focus on alleged reductions in quality of salmon due to harvest in terminal areas. The assumption of the study remains that salmon consumers experienced losses due to reduced quality. The objective of the study is to "measure the economic loss to seafood consumers." No description of the methods to be used is provided. Reference is made to development of conceptual models of consumer preferences and market characteristics. The need for an unspecified methodology for statistical analysis of changes in level and quality of harvest is mentioned. A data collection and analysis effort is included. The study appears to be an attempt to estimate demand functions for seafood products and to determine the effect of changes in quality and quantity, if any, on consumer surplus. The following comments apply:

Alleged losses not compensable.

The alleged losses which this study purports to measure are not compensable under the laws and regulations which govern natural resource damages. If any losses were incurred at any level of participation in commercial seafood markets, from fisherman through processor, wholesaler, retailer, and consumer, such losses are private losses, not losses of public resources.

Alleged losses are negligible.

The alleged losses which this study purports to measure are known, without further study, to be negligible. As discussed below, for reasons completely unrelated to the spill, salmon supply increased significantly in 1989 and prices decreased. These factors combined to substantially increase consumer surplus for the end consumer. Any quality decrease associated with increased terminal harvest in PWS and Kodiak would have, if any, an undetectable influence on consumer surplus.

The description of ECON1 states that models would be used to estimate, among other things, the "price changes associated with the spill." It is known that the spill had no impact on 1989 salmon prices. The Alaska Department of Fish and Game reports that, because of a record catch, the 1989 harvest provided the second highest value for Alaska salmon fisheries in history, even though prices were lower. ADF&G states "In 1989, salmon prices were calculated to be one-half to one-third lower than those paid in 1988. Factors contributing to these low ex-vessel prices include the reduced buying power of the Japanese yen (20% less than the previous year), surplus salmon inventories in Tokyo that were over 100,000 metric tons greater than existed the previous year, increased Japanese hatchery production of chum salmon, and increased sales of internationally farmed salmon on the open market" (Savikko and Page, 1990). The spill is not cited as a contributing factor.

Incorrect assumptions used.

The description of ECON1 further states that models would also be used to estimate the "effects of seafood quality and quantity changes on consumers." Alaska production of salmon increased by 37% from 1988 to 1989. Worldwide production increased 23%. The major markets for the Alaska salmon harvest are in fresh/frozen red salmon and canned pink salmon. Worldwide production of fresh/frozen red salmon increased 39% from 1988 to 1989. Worldwide production of canned pink salmon increased 100%. Hence, quantity was substantially higher at every market level, including processing, wholesale, retail, and

consumption. The State of Alaska assured that no deficient quality seafood reached the market through its rigorous quality assurance program.

Double counting of losses.

Claims by the Trustee Council for losses, if any, incurred by consumers "at every market level" would constitute double-counting of private claims already made by individuals, businesses, and classes. Although the Federal Trustee Council asserts that they "have taken all steps necessary to eliminate double-counting from the final economic damage estimates," no description is provided as to how this crucial objective will be achieved. Indeed, the economic study design will result in considerable duplication.

Other errors made.

There continues to be no apparent relationship between ECON1 and the numerous fish injury assessment studies contained in the Plan.

Much of the data required to estimate commercial fisheries losses, if any, is available from state and federal sources (e.g., Savikko, Herman, and Tim Page, "1989 Preliminary Alaska Commercial Fisheries Harvests and Values," Regional Information Report No. 5J90-07, Alaska Department of Fish and Game, Juneau, Alaska, May 1990 and others). Therefore, a costly, duplicative data collection effort is not appropriate.

Study Title: EFFECTS OF THE EVOS ON THE VALUE OF PUBLIC LAND

Study Number: ECONOMICS STUDY NUMBER 4 **Study Cost: $ -0-**

Although the 1991 Plan states that "[t]here may not have been sufficient land transactions to employ as the basis for determining any changes in the value of public lands affected by the spill," this study has not been dropped. No budget is provided for work in 1991, but it is unclear whether the study will be reactivated during the year. The vague description of methodology is a reduced version of the description contained in the 1990 Plan and remains inadequate. Trustee Council response to public comments on the 1990 Plan was limited to repetition of the claim that the Plan is not intended to provide description of study design or methods, but rather "to provide public notice of the type of studies being carried out or contemplated." Therefore, because the study description in the 1991 Plan is the same as the 1990 Plan, and because comments on the 1990 Plan remain unanswered, the same comments apply.

The study is intended to assess alleged losses in market value of public lands attributable to the oil spill. Description of the study methodology is exceedingly vague and lacks sufficient detail for evaluation. However, based on the description provided, the following comments apply:

Alleged losses not compensable as natural resource damage.

Reduction in land value, if any, is not compensable as a natural resource damage. Rather, land owners, including governments acting as proprietors, have recourse to private claims for such alleged damage. Therefore, this study is not appropriate as part of the natural resource damage assessment process.

Study does not identify affected lands.

The study description does not identify the public lands to be included in

the assessment. Damages cannot be claimed for lands not directly impacted by oil.

Multiple influences on land values ignored.

The study objective is stated to be "determine the change in market value of public lands." However, the study cannot assess spill effects by merely estimating pre-spill and post-spill prices. Many factors completely unrelated to the spill could cause a difference between pre-spill and post-spill land prices, e.g., interest rates. No indication is provided as to how such influences will be isolated.

Land values in the affected area are influenced by the dominant role of public lands, use restrictions, low population density, access problems, and severe weather. The study method is deficient because it does not contain a methodology for determining whether the lands affected by previous spills are comparable to lands in the subject area. It is further deficient because it does not set out a methodology for determining the comparability of previous spills with the EVOS.

Study will lead to double counting.

This study will contribute to double counting of damages because damages for some uses of public lands are covered by other studies. For example, ECON5 purports to estimate recreational use damages. The value of land directly reflects the services provided by the land, such as recreation. To the extent that foregone use of such services is included in other studies, ECON4 will result in double counting. The Plan must be more specific about how double counting will be avoided.

Hypothetical losses not compensable.

Reduced land values become actual losses only to the extent that sales actually take place during the period of depressed value, if such a period occurs. This

study must focus only upon losses incurred in actual transactions, not hypothetical losses which would have occurred only if sales had taken place.

The Plan incorrectly implies that losses in sales prices of public land leased or sold in 1989 will apply to all public land in the affected area.

Substitutes ignored.

There is a vast supply of near substitutes for almost any parcel of land in Alaska. In addition, most of the allegedly affected area consists of state and federal lands and is rarely subject to sale. Therefore, compensable damages to land values are expected to be very low. Consequently, study costs are unlikely to be reasonable.

Project description incorrect and incomplete.

The 1991 study description is even more brief and inadequate than contained in the 1990 Plan. The study premise and objective remain the same as the 1989 and 1990 studies. This indicates that little or no progress was made in 1989 or 1990. Status of the 1989 and 1990 studies and corresponding expenditures should be available for evaluation of the 1991 Plan.

No provision is made to account for recovery in land value which results from cleanup and restoration.

Study Title: ECONOMIC DAMAGES TO RECREATION

Study Number: ECONOMICS STUDY NUMBER 5 **Study Cost: $390,400**

The study description contained in the 1991 Plan is identical to that contained in the 1990 Plan except for addition of "users of air charters" and "hunters" to the list of users which allegedly might have experienced losses. Trustee Council response to public comments on the 1990 Plan is limited to: (1) assurance that double counting will be avoided, (2) claims that contingent valuation is an "approved " method for valuing natural resource injuries, (3) assurances that substitution will be properly accommodated, and (4) assurances that all available relevant data will be used. No details are provided as to how such features will be incorporated into the study design.

The study is intended to assess damages, if any, incurred by recreational users of resources allegedly affected by the EVOS. It attempts to estimate changes in consumer surplus for recreational users who chose substitutes or who experienced a reduced level of satisfaction. Although the Plan provides several lists of tasks, it contains no detail about what methods will be used or how they will be used, nor does it include milestones and schedules. However, based on the description provided, the following comments apply:

Substitute resources ignored.

The assumptions of the study still ignore known facts that would, if properly included, influence study design and scope. For example, the most popular sea kayak and charter boat destinations (the College Fjords and Columbia Glacier areas) were unaffected by the spill. Also, increased escapement due to closure of commercial salmon fisheries led, in all likelihood, to increased sport fishing catches.

Contingent valuation methods invalid for this situation.

Contingent valuation is cited, without necessary detail concerning application, as a method to be used in estimating alleged use losses incurred by sea kayakers. CV is an unproven and highly controversial methodology; without details of the method of application, it is impossible to ascertain whether it can provide any valid or reliable results.

Study improperly focuses on commercial services.

Notwithstanding Trustee Council statements that they "do not contemplate estimating purely private losses," estimation of any private losses is inappropriate in this study. Furthermore, it is still not clear whether the study is intended to also estimate damages or benefits to commercial providers of recreational services (equipment rental businesses, charter boat services, tour boats, guides, etc.). Damages should only be considered for non-commercial recreational uses of the resources. Compensation is available to public trustees for foregone public use of publicly owned natural resources only.

The Plan still gives no indication of how the effect of the spill on demand for cruise ship tours to PWS will be determined.

Losses will be double counted.

The study continues to provide extensive opportunity for double counting of damages. Within the study, for example, it remains unclear how double counting of recreational fishing and boat charters for sport fishing will be avoided, or sea kayaking and boat charters for kayak transportation. Furthermore, alleged damages included in this study continue to duplicate, in part, alleged damages included in ECON4.

Study description is inadequate.

As was the case in the 1989 and 1990 Plans, the lack of descriptive detail concerning study methodology makes it difficult to evaluate how substitution will be accommodated.

The entire description of the 1990 Plan is repeated within the 1991 Plans just as the 1989 Draft Plan description was repeated in the 1990 Plan. This indicates that no work was carried out in 1989 or 1991 or that no progress was achieved in either year. It continues to be particularly important that data for this study not already available from conventional sources be collected while still accurately recalled by the source. It appears that such opportunities were missed.

No citation is yet provided of what specific "existing model for recreational fishing in the KP area" will be investigated, what criteria will be applied to determine its applicability, what will be done if the model proves inadequate, or what geographical area will be examined.

Study duplicates existing government programs.

As noted in comments on the 1990 Plan, much of the data required for this study is routinely available, or will be available, from federal and state government or business sources. Examples include cruise ship bookings, cruise line capacities, visitor rates, hotel occupancy rates, sport fishing catch rates, rail passengers, and many more. A costly, duplicative data collection effort is not required.

Study Title: LOSSES TO SUBSISTENCE HOUSEHOLDS

Study Number: ECONOMICS STUDY NUMBER 6 **Study Cost: $532,100**

The 1991 study description is identical to the 1990 description except for: (1) deletion of Kodiak from the list of locations of subsistence communities, (2) elimination of "health concerns" as alleged reason for reduced subsistence harvests, and (3) deletion of reference to use of non-market survey methods similar to those "described" in ECON7. Trustee Council response to public comment on the 1990 plan is confined to (1) assurances that double counting will be avoided, (2) claims that contingent valuation is an "approved" methodology for valuing natural resource injuries, (3) claims that the plan is for no purpose other than public notice of the type of study being contemplated and that useful descriptions are not appropriate, and (4) that study status is litigation sensitive and cannot be divulged. Accordingly, all comments provided for the 1990 study remain relevant.

ECON6 remains directed toward losses allegedly incurred by subsistence communities due to (1) foregone subsistence use, (2) local inflation, (3) property damage, and (4) loss of "intrinsic" value. Documentation of the Plan is still inadequate. The statement of objectives continues to be a list of tasks without explicit statement of the study objective. No description of methods is provided. Milestones and schedules are not included. The following additional comments apply to the limited description provided:

Double counting of losses likely.

This category of alleged losses remains the subject of other claims, including claims by native groups, which indicates a potential for double counting.

Alleged losses of non-use values by subsistence communities is also included in the subjects of Economic Studies Number 7 and 9. No method is provided to distinguish subsistence populations from the relevant populations included in

ECON7. No method is provided to quantify the archeological-based non-use values referenced in ECON9 and reduce the non-use values estimated in other studies accordingly. Double counting is an inevitable consequence of the lack of study integration.

Contingent valuation invalid for this situation.

There is still no discussion of the goods or amenities which will be the subject of analysis by either market or non-market methods. If the vague reference to "a number of (unspecified) methodologies" being "considered for the estimation of economic damages to non-market goods and services" is meant to include contingent valuation, comments concerning that unproven and controversial technique remain valid. The study description still provides insufficient detail to determine whether this method could conceivably lead to valid or reliable data.

Mitigation efforts not considered.

There is still no indication of how the study will accommodate mitigation fforts or income effects that offset losses. ESC undertook successful efforts to deliver food and materials to subsistence villages and to provide accurate information to subsistence populations. Furthermore, income gains from employment in the cleanup effort might result in net benefits and explain (through revealed preference) why subsistence households ceased to rely on traditional sources.

Reduced subsistence harvesting might be, in part, a result of increased employment opportunities. Members of subsistence households might have chosen to forego some harvesting activities in 1989 and, perhaps, again in 1990 to take advantage of income opportunities provided by the cleanup. The Plan still contains no indication of how such choices will be identified and evaluated.

Study description inadequate.

The Plan duplicates all parts of the 1990 study which, in turn, duplicated all parts of the 1989 study. This indicates that little or no progress was made in 1989 or 1990. Status of the 1989 and 1990 studies and corresponding expenditures should be available for evaluation of the 1991 Plan.

Study Title: TOTAL VALUE OF NATURAL RESOURCES INJURED BY THE EVOS

Study Number: ECONOMICS STUDY NUMBER 7 **Study Cost: $1,964,600**

This study now purports to estimate the "total value" of natural resources allegedly affected by the EVOS. It now apparently attempts to use contingent valuation to estimate the sum of "intrinsic" and use values. This change of study title apparently acknowledges that it is difficult, if not impossible, to separate components of value in surveys based on creation of imaginary markets for hypothetical goods. The study description continues to use the term "intrinsic values" to mean existence value, option value, and bequest value. As discussed in comments on previous plans, economists generally confine the term "intrinsic value" to define inherent worth that natural objects possess independent of any values held or perceived by humans. Furthermore, economists agree that principles of economics do not extend to such concepts. Also, properly defined, no legal basis exists for damages based on "intrinsic value." The term "non-use values" is usually applied to any human-held values which are independent of use. Hence, this study, in its revised form, seems aimed at attempts to estimate the sum of use and non-use values without trying to distinguish between the two. Among the most apparent study deficiencies are the following:

Bequest, option, and existence value concepts do not apply.

Due to the naturally degradable characteristics of crude oil and the ability of nature to restore itself after bulk oil removal, full restoration of the natural resources will occur within a relatively short period. There will be no reduced endowment for future generations. Therefore, bequest values will not have been reduced. Similarly, the physical injuries are neither permanent nor irreversible. There cannot be losses of existence or bequest values for temporary injuries to natural resources. Also, option values represent the expected discounted value of future use. Because future use is not expected to

be adversely affected by the spill, option value losses must be confined to small effects, if any, experienced prior to recovery.

Concepts of non-use value losses have been confined in the literature to permanent, irreversible injury to unique resources. The extension of such concepts to temporary injury to resources for which there are vast numbers of substitutes is contrary to the basic principles of the concept.

Contingent valuation methods invalid in this situation.

The study depends entirely upon the highly questionable validity and accuracy of contingent valuation. As mentioned in commentary on other economics studies in the 1991 Plan, contingent valuation is unproven and controversial. All evidence suggests that it cannot provide valid or reliable measurements of non-use values in the circumstances of this case. Contingent valuation is an attempt to create a hypothetical marketplace in which people try to attach hypothetical values to goods like existence values which are not actually traded in any real market and which exist only as ideas. It is a method which has not been tested in damage assessment and which exhibits critical shortcomings well known to even its small group of practitioners. It is not widely accepted by economists or survey experts, many of whom believe that additional research will demonstrate convincingly its inapplicability to assessment of non-use damages. Contrary to statements in the Trustee Council response to public comments on the 1990 Plan, contingent valuation is not an appropriate method for "valuing natural resource injuries." Nor was "[u]se of contingent valuation ... approved by the court in Ohio v. Department of the Interior." The reliance on the Ohio decision to validate contingent valuation as a reliable measure of non-use is misplaced. The court only offered the opinion that DOI should identify non-market assessment methods and that such methods include contingent valuation for some applications if the technique could be shown to be valid and accurate. This opinion was made without reference to specific categories of non-market goods and services to which contingent valuation might apply. It must be assumed that the court did not intend to endorse a methodology which doesn't work, and contingent valuation

has not been shown to work when used to estimate non-use damages. The Trustee Council has presented no evidence, nor is there any, that contingent valuation is a concept which can be used to assess non-use or total values of injured resources.

Reference made to use of willingness to accept measures.

In response to comments on the 1990 Plan, the Trustee Council state that, "Both willingness to pay and willingness to accept will be considered in the contingent valuation study." (1991 Plan, Volume II: Appendix D, p. D-158). Use of willingness to accept measures would constitute a clear deviation from the DOI regulations which provide that attempts to apply contingent valuation methodology requires use of willingness to pay measures. § 11.83(d)(7).

Estimation of "total value" includes double counting.

The Trustee Council recognize that this study attempts to estimate alleged damages which are also the subject of other economic studies. However, no description is provided of the methods that will be used to compare estimates from the several duplicative studies and to determine which, if any, provides the most accurate assessment.

More reliable methods are available to estimate use values.

This study now attempts to estimate total value as the sum of use and non-use ("intrinsic") values:

$$a = b + c$$

Where a is total value, b is use value, and c is non-use value. The study will try to use contingent valuation to estimate a, with no attempt made to distinguish between b and c. Other, more reliable methods are available to estimate b. These include travel cost and hedonic pricing methods. If contingent valuation is used to determine b, and it is found that $a \gg b$, then additional concern arises about the validity and accuracy of contingent

valuation. For example, under such conditions it would be necessary for the advocates of contingent valuation to argue that $a \approx c$ and that the contingent valuation process would therefore be estimating non-use values, a de facto return to the original study concept in which contingent valuation was being used in an attempt to estimate "intrinsic" values. The study design, survey instruments, and results would then correspond to the circumstances under which the validity and accuracy of contingent valuation is most doubtful, i.e., estimation of non-use values.

Procedure is required to estimate damages.

The study represents an attempt to estimate total value. Damages, if any, are some fraction of the "total value of natural resources." The study description provides no indication of how damages will be derived from attempts to estimate value.

Study description is inadequate.

Description of the Plan is inadequate. No milestones or schedules are provided. Methods are described in exceptionally vague terms. The entire research plan for this nearly $2-million study is confined to less than a single page. No information is provided to explain the size of the budget. Even less budget detail is provided than was contained in the 1990 Plan.

Statistical design and quality assurance provisions of the study are not described. No indication is given of how the sample population was defined or how a representative sample will be drawn.

Like the other economic studies, the plan for ECON7 contains every component of the 1990 Plan which, in turn, was a duplication of the 1989 Draft. This indicates that little or no progress was made in 1989 or 1990. Status of the 1989 and 1990 study and corresponding expenditures should be available for evaluation of the 1991 Plan.

Study Title: **ECONOMIC DAMAGE ASSESSMENT OF RESEARCH PROGRAMS AFFECTED BY THE EVOS**

Study Number: **ECONOMICS STUDY NUMBER 8** **Study Cost:** **$104,900**

The description of ECON8 contained in the 1991 Plan is identical to that in the 1990 Plan. The budget has been more than doubled. The study description contains no information about study methods, milestones or schedules. The following comments still apply:

Study covers noncompensable losses.

The Plan still contains no indication of what part of applicable statutes or regulations are being interpreted to extend trustee responsibility to assessment of research losses. Researchers and research institutions are the proper parties to assert claims for such losses, if any. Losses identified with alleged reductions in the knowledge available to mankind are speculative since there is no assurance that those research programs would have proven successful or that unique or useful information would have been obtained. Additionally, no consideration is given to the large increases in knowledge provided by spill-related research.

Study description inadequate and incomplete.

There is still no identification of research activities delayed or cancelled as a result of the spill. It is, therefore, not possible to determine if study costs are reasonable.

The Plan still does not describe the criteria to be applied to assure that assessment is directed to committed use of the resource.

The Plan still provides no information about how "total project costs, extra sums expended and amounts spent on each study" will be used to evaluate research losses.

The Plan repeats all parts contained in the 1990 Plan which, in turn, repeated the 1989 Draft Plan. This continues to indicate that little or no progress was made in 1989. Status of the 1989 and 1990 efforts and corresponding expenditures should be available for evaluation of the 1991 Plan.

Study Title: QUANTIFICATION OF DAMAGES TO ARCHEOLOGICAL RESOURCES

Study Number: ECONOMICS STUDY NUMBER 9 **Study Cost: $ - 0 -**

The description of ECON9 in the 1991 Plan is identical to that contained in the 1990 Plan. The 1991 Plan notes that no work had been done on the study in 1989 or 1990 and that no funds are requested for 1991. It states further that if results are obtained from the "archeological science study," this study will be reactivated and funded at an unspecified level. Because the study description remains the same, and because public comments on the corresponding prior year plans were not adequately addressed, the following comments apply:

Archeological damages not covered by NRDA.

There continues to be no information in the Plan which explains how the definition of natural resources is extended to include the remains of past human activity.

Losses will be double counted.

Although statements in the Trustee Council's response to comments on the 1990 Plan repeatedly assure that double counting will be eliminated from all aspects of the assessment, still no methods are identified to assure that this necessary objective is achieved. ECON9 continues to incorporate several clear examples of double counting. First, alleged loss of value of archeological resources as tourist attractions is cited. Such losses are also counted in Economics ECON5. No methods are cited by which alleged tourist sightseeing losses identified in ECON5 will be segregated into different sightseeing purposes with account taken for the duplicative estimates of archeological sightseeing obtained in ECON9. Similarly, no method is described by which archeological science value will be excluded from ECON8. As mentioned elsewhere, "intrinsic" values held by native groups are triple counted unless some unidentified method is available to divide "intrinsic" value into a

complex array of subcomponents (e.g., existence values for archeological resources, differentiated from existence values for cultural heritage, and differentiated from culturally-derived "intrinsic" values held by native groups as members of the general population).

Study description inadequate and incomplete.

The Plan still contains no information or discussion whatsoever of any methods for measuring economic damages. There continues to be no indication of how allegedly damaged sites will be valued. The section of the Plan entitled "Methods" still merely enumerates possible sources of value for archeological resources with no reference to how the values would be quantified or how alleged damages would be valued.

The Plan continues to refer to "unique or spectacular archaeological sites [which] have value as tourist attractions," but still does not identify those sites. Trustee Council response to public comments on the 1990 Plan ignores the request to list the "unique and spectacular sites [which] have value as tourist attractions" by merely noting that all archeological sites are unique.

As for all other economics studies, the 1991 Plan for ECON9 contains everything originally planned for 1989 and then again for 1990. It is confirmed that no progress was made in 1989 or 1990.

Study Title: PETROLEUM PRODUCTS PRICE IMPACTS

Study Number: ECONOMICS STUDY NUMBER 10 **Study Cost: $271,300**

This study will attempt to estimate economic damages to consumers of petroleum products by using existing data and models as well as improved data and methods which are developed if a connection between the EVOS and petroleum market price increases can be shown by statistical analysis.

Petroleum product price impacts not covered by NRDA.

No explanation is given for how the alleged damages which are the focus of this study flow from an injury to natural resource nor does there appear to be any. Even it this could be shown, these alleged impacts would be secondary or indirect economic effects on private individuals. Furthermore, assuming a causal connection between the EVOS and a specific petroleum products price increase can be demonstrated (which appears to be implausible given the many variables affecting petroleum product prices), the proper claimants would be the consumers and/or distributors of the affected products.

Study description is inadequate.

No information is given concerning the type of data or models to be utilized nor is there any description of the statistical method to be utilized to show a connection between the EVOS and the alleged petroleum products price increases. No justification is given for why new data or models may have to be developed. Without this information, it is impossible to review and evaluate the technical soundness of this study.

APPENDIX - SECTION J

DETAILED COMMENTS ON

THE DRAFT 1991
RESTORATION WORK PLAN

EXXON COMPANY, U.S.A.

POST OFFICE BOX 2180 • HOUSTON, TEXAS 77252-2180

SPECIAL PROJECTS

JOHN SEDDELMEYER
CHIEF ATTORNEY

April 12, 1991

Secretary
Restoration Planning Work Group
Oil Spill Restoration Planning Office
437 "E" Street, Suite 301
Anchorage, Alaska 99501

Gentlemen:

The attached document provides Exxon Shipping Company's comments on the Draft 1991 Restoration Work Plan for the Valdez spill. Some of the principal points are summarized below.

First and foremost, the Draft Plan does not contain information vital to understanding and evaluating the proposed restoration activities. There is a complete lack of information concerning the nature and extent of the resource injuries which would justify active restoration measures, or why the proposed restoration activity is the preferred restoration alternative. Without this information, no one can determine whether the proposed activities are necessary or reasonable. Information concerning the nature and extent of the injuries to the natural resources impacted by the oil spill is a prerequisite to evaluating and proposing restoration activities.

The Draft Plan does not incorporate and follow the restoration planning procedures set forth in the DOI NRDA regulations. These procedures require that a range of restoration options, including natural recovery, are considered and that the cost-effective alternative is selected. They also require that the restoration project be limited to measures which restore or replace the resource services to no more than their baseline. Projects are chargeable to the potentially responsible party only if they satisfy these standards.

In particular, the Draft Plan does not require selection of the cost-effective restoration alternative nor is it limited to restoration of the injured resources to their baseline service levels. While the Draft Plan provides for consideration of the

cost effectiveness and reasonableness of costs of the restoration project, it does not require selection of the cost-effective alternative. It is also unclear how the Draft Plan evaluates cost effectiveness under its own standards. Furthermore, much of the proposed 1991 restoration planning activities appear to be basic scientific research being conducted under the guise of restoration feasibility studies.

Finally, the major thrust of the restoration work proposed in the Draft Plan appears to be focused on the acquisition of strategic habitats and recreation sites with absolutely no justification that these acquisitions represent the best means of restoring the injured resource. Instead, the restoration program seems primarily directed toward addressing impacts on resources caused by activities other than the oil spill. While such impacts may be legitimate environmental concerns, they are not relevant to the Trustees' obligation to devise a sensible and reasonable restoration plan to address injuries caused by the oil spill.

Very truly yours,

John Scddelmeyer /by M.D.

JS:rmm
Attachment

EXXON SHIPPING COMPANY

THE DRAFT 1991 RESTORATION WORK PLAN FOR THE EXXON VALDEZ OIL SPILL

REVIEW COMMENTS
APRIL 12, 1991

This document provides Exxon Shipping Company's ("ESC") comments on the Draft 1991 Restoration Work Plan published in the Federal Register on March 1, 1991 (46 Fed. Reg. 8898). The Draft 1991 Restoration Work Plan ("Draft Plan") is comprised of restoration planning and initial implementation activities under consideration by the Trustee Council for 1991. A revised 1991 Restoration Work Plan ("Final Plan") is expected to be published in the Federal Register in Spring 1991.

Since the Draft Plan does not contain all the information necessary to evaluate the proposed restoration activities, ESC's comments will primarily identify the missing information and point out the standards which should be used to evaluate restoration activities. The NRDA regulations promulgated by the Department of Interior, 43 C.F.R. Part 11, ("DOI regulations") constitute the best available procedures for conducting and implementing a natural resource damage assessment and consequently provide the standards under which proposed restoration activities must be evaluated. These regulations require that the 1991 Restoration Work Plan be judged by its ability to identify the necessity for, and the reasonable costs of, restoration of injured resources. It is against these standards that ESC has evaluated the Draft Plan's merits and offers its comments.

Part 1: General Concerns

The Draft Plan contains insufficient information to evaluate the proposed restoration activities.

The March 1, 1991 Notice states, in part: "The Trustees and EPA have chosen to present this document to obtain public comment and to invite suggestions about other restoration activities that should be considered." The Notice also states that: "The Trustees intend to provide an opportunity for meaningful public review and comment on all restoration implementation activities." However, the Plan does not contain information vital to understanding and evaluating the proposed restoration activities. Additionally, the Draft Plan's lack of information on the results of the Trustees' damage assessment studies seriously impedes one's ability to suggest alternative restoration activities or measures. Sound technical information concerning the nature and extent of the injuries to the natural resources impacted by the oil spill is a prerequisite to evaluating and proposing restoration activities.

The DOI regulations require the use of specific information to determine the necessity for, and the reasonable costs of, a restoration plan. To comply with the DOI regulations and to allow for meaningful review, the Final Plan must provide the following information:

- A complete description of the natural resource to which the restoration project is directed.

- A description of the injured resource's baseline.
- A description of the injury suffered by that resource, including the injury's pathway and an estimate of the amount of the resource which has been impacted.
- The specific locations of the injured resources.
- An estimate of the foregone benefit or service level reduction caused by the injury.
- A valuation of the loss attributable to the foregone benefit or service level reduction.
- An explanation of how the proposed restoration project will remedy the identified injury, as well as an estimate of the time required to achieve full restoration.
- A description of alternative restoration measures, including natural recovery, as well as an estimate of the time to achieve full restoration using those alternatives.
- A cost-effectiveness analysis which justifies selection of the proposed restoration activity in lieu of the alternatives, including natural recovery.

Without the above information, the EPA, the Trustees, the Potentially Responsible Parties (PRP), and the public cannot determine whether the proposed restoration activities are necessary or cost-effective. Conversely, with this information all the parties can evaluate the proposed restoration activities against objective standards. This information will also assure the parties that the proposed restoration activities are

necessary and will make a meaningful contribution to restoration of the injured resources. Without this information, the parties can only speculate on the limited information provided as to the appropriateness of the proposed activities.

The Final Plan must incorporate and follow appropriate restoration planning procedures to determine necessary restoration work.

The Draft Plan describes four proposed implementation projects. Whether any of these proposed activities qualify as a necessary restoration project depends upon its being the cost-effective restoration alternative which will restore the injured resource to its baseline. Without the information described in the above section, no one can determine if these proposed activities constitute necessary restoration work.

ESC believes that it is especially important that the Final Plan incorporate and follow the procedures set forth in the DOI regulations (and, in particular, those found in 43 C.F.R. Sec. 11.81 and Sec. 11.82) in determining necessary restoration projects. These procedures ensure that a range of restoration options, including natural recovery, are considered and that the cost-effective alternative is selected. These procedures also require that the restoration project be limited to measures which restore or replace the resource services to no more than their baseline. Finally, these procedures provide that a restoration alternative that involves the acquisition of land for federal management shall not be developed unless in the judgment of the

federal agency acting as trustee, such acquisition constitutes the only viable method of obtaining the lost services.

ESC believes that the only restoration work which is chargeable to the PRP is that which can be justified under the principles embodied in the DOI regulations as necessary restoration work. Activities and projects which do not satisfy these principles may be desirable projects from a conservation or preservation viewpoint, but they do not constitute chargeable restoration costs. Whether any of the proposed 1991 restoration activities can be justified is dependent upon the Final Plan incorporating and following the restoration planning procedures set forth in the DOI regulations.

Part 2: 1991 Restoration Planning and Implementation Activities

The proposed planning process does not require the selection of the cost-effective restoration alternative and is not limited to restoration of the injured resources to their baseline.

The Draft Plan states that "evaluation of potential restoration alternatives will consider such factors as: . . . cost effectiveness and reasonableness of costs of the restoration project in light of the value or ecological significance of the resource." ESC believes that the restoration planning process should not just consider the cost effectiveness of the restoration alternative but require selection, as do the DOI regulations, of the cost-effective alternative. Furthermore, the reasonableness of the cost of a restoration project must be evaluated through a cost-benefit analysis. This, in turn, requires a valuation of the benefits associated with the proposed restoration project.

The Draft Plan states that a "key goal" of the restoration planning activities is to "identify life history requirements, limiting factors, and environmental processes that are especially sensitive or that may be enhanced." These goals seem to go beyond identifying cost-effective restoration measures which will return the injured resources to their baseline. Another example is the 1990 Restoration Feasibility Studies and the Restoration Feasibility Studies being considered for 1991. These studies appear to be basic scientific research rather than necessary

restoration work. More importantly, the studies have been or are being undertaken before there has been any determination or quantification of injury to the resource in question. ESC believes that it is premature to conduct restoration feasibility studies before the injury is first quantified and understood. Without this understanding, it is difficult to see how one can design a meaningful restoration program or test its feasibility. ESC believes the planning process contained in the Final Plan should require selection of the cost-effective restoration alternative and be limited to identifying and evaluating restoration activities that restore the injured resources to their baseline.

Based on the information contained in the Draft Plan, the proposed 1991 restoration activities are not justified.

As noted in our earlier comments, there is insufficient information to determine whether the proposed 1991 restoration activities constitute necessary restoration work. The Draft Plan does not even contain a rudimentary injury determination to inform the reader of the nature and extent of the injury let alone any explanation of why the proposed restoration activity is the best restoration alternative. Consequently, the Draft Plan does not adequately justify the proposed 1991 restoration activities. In addition to correcting the major deficiencies already discussed in these comments, the Final Plan should also address the following project specific comments:

Restoration of the Beach Wild Rye Community: At a minimum, the specific locations of the injured rye grass communities should be identified in the Final Plan, and a comparison of the results expected from natural recovery and transplanting/fertilizing should be provided.

Public Information and Education Project: Assuming that this project will allow injured resources to recover more rapidly by minimizing harmful human disturbances in a cost-effective manner taking into account restrictions on human use, the information should be limited to how to avoid disturbing the resources in question. If information concerning changes to the ecosystem resulting from the oil spill is considered necessary to achieve the project's objective, ESC believes that a balanced and objective assessment of those changes will emphasize both the temporary effect of the oil spill and the rapid and robust recovery which has already occurred and continues in the oil spill area. Otherwise, this project will misinform the public of the true nature and extent of the injuries to the resources and undermine the credibility of the information presented by the project.

Salmonid Stocks and Habitat Restoration: Based upon the information provided, it appears that this project contemplates activities which go beyond restoration of an injured resource to its baseline levels. Specifically, the

project contemplates construction of spawning channels and fish ladders to overcome physical and hydrological barriers. These may very well be desirable conservation or fish management projects but they appear to be designed to enhance the resources beyond their baseline. Additionally, these measures are not consistent with the wilderness character of the area.

Protection of Strategic Fish and Wildlife Habitats and Recreation Sites: ESC is troubled by the scope of this project in that it does not appear to be limited to the oil spill area. No information is given to explain the need to protect habitats or recreation sites outside the area impacted by the oil spill to address injuries related to the oil spill. In any event, ESC has serious concerns whether the activities contemplated by this project can be justified as cost effective compared to natural recovery or other more direct restoration measures.

7 Respondences

001 - Sam Booher

Comment #	Code
1	104
2	104

002 - G.H. Holliday, Holliday Environmental Services

Comment #	Code
1	208
2	208, 210, 211
3	251

003 - National Wildlife Federation

Comment #	Code
1	103
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004 - American Petroleum Institute

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005 - Alyeska Pipeline Service Company

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11	204, 354, 355
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006 - Exxon Shipping Company

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007 - Natural Resources Defense Council

Comment #	Code
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3	102, 201
4	212, 214, 216, 217
5	203
6	2400, 2420
7	2420
8	351, 353
9	203, 202

Natural Resources Defense Council

PLEASE DELIVER FAX TO: Dave Gibbons

ORGANIZATION: Forest Service Oil Spill Coordinator

THIS TRANSMISSION IS 5 PAGES, INCLUDING COVER SHEET.

FAX IS FROM: Sarah Chasis

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IF THERE ARE PROBLEMS WITH THIS TRANMISSION
PLEASE CONTACT STEVEN BLEVINS AT (212) 727-2700.

NRDC'S NEW YORK OFFICE FAX NUMBER: (212) 727-1773

Comments
of the

Natural Resources Defence Council
on the

1991 State/Federal
Natural Resource Damage Assessment
and Restoration Plan
for the Exxon Valdez Oil Spill

Prepared by

Sarah Chasis, Senior Attorney, NRDC Coastal Project

June 3, 1991

The Natural Resources Defense Council, Inc. (NRDC) submits the following comments on the 1991 State/Federal Natural Resource Damage Assessment and Restoration Plan for the Exxon Valdez Oil Spill (April 1991). The 1991 plan describes the third year of studies to be undertaken by the federal government and State of Alaska to determine the injury to natural resources resulting from the Exxon Valdez oil spill. In the past two years NRDC has submitted detailed comments on both the 1989 and 1990 Natural Resource Damage Assessment Plans for the Exxon Valdez oil spill. Many of those earlier comments are still pertinent to the 1991 Plan and we incorporate those earlier comments by reference.

NRDC appreciates this opportunity to comment on the 1991 Plan. We are glad to see that the plan has been circulated for public review earlier than in previous years (in the late spring as opposed to the fall). However, NRDC still strongly objects to the timing of public review of this plan. By the time public comments are received in early June, most of the studies will have already commenced. Thus the comments can have no impact on the design and little impact on the implementation of most of the studies described. This undermines the utility of the public comment process and precludes meaningful public participation. NRDC and other commenters have raised this objection in the past and specifically requested that this problem be rectified. While some progress has been made, the opportunity for public input still comes too late to be meaningful.

Another major deficiency in the 1991 Plan is the failure to include any description of the results of the first two years of studies. It is absolutely crucial in evaluating which studies should or should not continue and the manner in which the studies should be undertaken to have familiarity with the results of the prior years of study. Yet the 1991 Plan is essentially devoid of such information.

The "Summary of Effects of the Exxon Valdez Oil Spill on Natural Resources and Archeological Resources" (March 1991), filed by the federal government with the federal court in Alaska on April 8, 1991 is certainly a step in the right direction. However, this summary is very brief and provides none of the background information that would assist outside scientific review of the 1991 studies.

While the federal government has said they would make their data publicly available (over time), very little of that data are as yet public. Moreover, the State has made no similar commitment. Thus data from both State conducted studies and jointly conducted studies (both state and federal) are not available, nor is there a commitment to make them available. Scientists whom NRDC has consulted for expert comment have repeatedly pointed out how difficult it is to render meaningful comment on the assessment and restoration plan without access to such data.

In general the 1991 Plan is much better than previous versions.

The description of individual workplans is in general much improved form previous plans. The objective of each project and the hypotheses to be tested are more completely laid out and the methods described are in sufficient detail to determine what type of work will actually be done. However, little if any information is given as to why particular studies are still included in the plan. From many of the project descriptions given, it is difficult to tell to what extent information gained during the first two years of study has been factored into the 1991 study plan. Many studies appear to be just repetitions of what has gone on previously. Particularly bothersome is the indication in many of the study plans that they are finally getting around to quantitatively examining data collected during the 1989 and 1990 field seasons. It is encouraging to see that in many studies multiyear sampling is planned to assess the long-term damage to the ecosystem. However, still lacking is a holistic approach to what studies are needed, and a clear plan to ensure that results and conclusions obtained from individual studies will be incorporated into a unified damage assessment.

The document contains a section promising that adequate peer review has been and continues to be undertaken at all stages of the damage assessment. Despite the fact that a fairly sizable budget is associated with this effort, no details have been given as to which scientists are reviewing the process, what their suggestions have been or to what extent the Trustees have been following the advice of reviewers. Similarly, only a brief description is included of the public information support activities. These will become increasingly important and cannot afford to be put off any longer.

We are pleased to see that there appears to be more emphasis placed in this plan, as compared with earlier plans, on subtidal injury assessment. We are encouraged that more deep water grab samples are being proposed. However, based on conversations with scientific experts in the field, NRDC wishes to raise two concerns. First, on pages 197 and 199, reference is made to the fact that taxonomic identifications of the shallow and deep benthos will only be taken to the family level or possibly, in the case of deep benthos, to "an appropriate higher taxonomic level." This means that individual species (as well as genuses) will not be identified and consequently the impact of the spill on individual benthic species will not be understood. However, biological diversity occurs principally at the species level. In order to assess the spill's impact on this important biological diversity, the impact at the species level must be assessed, not at the family or higher level. Otherwise, there could be a significant reduction in species diversity as a result of the spill, without such an occurrence being observed by the proposed studies. In fact, in environments stressed by oil spills and other pollutants, there is typically a significant reduction in the number of species. The method here proposed, of identifying benthic organisms only at a higher taxonomic level, would not pick up this evidence of stress.

There is a suggestion (p. 199) that species identification might occur in areas where particular taxa are especially abundant. However, this should not be done just where there is an abundance, since it is in stressed environments, where there is a reduction in abundance that the effects may be most significant.

The other major concern about the subtidal studies is that deep benthic biological sampling is proposed to be carried out at 40 meters and 100 meters of depth (p. 198). It would be advantageous to conduct sampling along a continuum in deepwater between 40 meters and 100 meters, as well.

This plan contains no specific information on what restoration planning or implementation projects will be carried out this summer. NRDC and others submitted comments on an earlier federal register notice (March 1, 1991) that outlined possible projects. However, no further information is provided here as to what the Trustees have decided to do. Nor is there a budget included for any restorative implementation projects. How will such projects be funded if they are not budgeted as part of this plan. More detail on restoration plans and projects is needed.

The plan states that a Chief Scientist will be charged with coordination and direction of all scientific damage assessment studies. This sounds like a good idea, but more information is needed. Is it intended that this be NOAA's Chief Scientist or another agency's Chief Scientist? NRDC believes NOAA's Chief Scientist is probably best suited for this task. How does this proposal differ from current practice and decision-making? Most importantly, how does such a proposal adequately factor in a role for the State of Alaska, or is this proposal one for federal decision-making only? We would appreciate more information on all these points as soon as possible.

NRDC appreciates this opportunity for comment and looks forward to the Trustees' response to our concerns.

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Comments of the National Wildlife Federation on The 1991 State/Federal Natural Resource Damage Assessment and Restoration Plan for the Exxon Valdez Oil Spill, May 31, 1991

The National Wildlife Federation (NWF, or the Federation) appreciates this opportunity to provide comments on The 1991 State/Federal Natural Resource Damage Assessment and Restoration Plan for the Exxon Valdez Oil Spill (1991 Plan). Background organizational information concerning the Federation and a summary of its involvement in litigation and restoration planning with respect to the Exxon Valdez oil spill (EVOS) can be found in NWF's comments submitted on the 1989 and 1990 plans and the draft 1991 restoration work plan, which comments are incorporated herein by reference.

The 1991 Plan reflects a substantial advancement in terms of specificity and thoroughness over the 1989 and 1990 documents. NWF commends the Trustee Agencies for their efforts to formulate scientifically defensible procedures for the damage assessment studies and to establish peer review and quality assurance/control mechanisms. As we acknowledged in our 1990 plan comments, NWF is cognizant of the tremendous difficulties confronting the Trustees in the tasks of identifying and evaluating the effects of the EVOS and formulating plans for restoring the environment. With respect to certain (and what by now seem perennial) problems, however, the 1991 Plan fails in the face of these challenges. These problems and various other concerns are discussed below.

Timing and Public Participation

NWF remains concerned that the opportunities provided for public involvement in the natural resource damage assessment and restoration planning process have been too late to enable meaningful participation. Although the The 1991 Plan is a great improvement over the 1989 and 1990 plans (when public comments were not solicited until after the field seasons addressed by the plans), still comments on the 1991 Plan will not be received until after many field studies have commenced. Even for those studies not yet begun, comments will not be sufficiently timely to allow the Trustees or researchers to make any adjustments in their plans in response to comments received.

Deletion of Studies

NWF is also troubled by the ongoing pattern of discontinuing studies with little or no explanation of the reasons therefor. The Trustees effectively ignored our comments of November 30, 1990, concerning those studies discontinued in the 1990 Plan. Indeed, in their preface to Volume II of The 1991 Plan (Response to Public Comment), the Trustees state: "Comments concerning individual studies that have been discontinued or completed are not addressed." Once again, in The 1991 Plan, several studies are deleted without explanation. (The gratuitous statement, "Studies were discontinued for a variety of reasons ...," Vol. I at 2, tells the reader nothing about how or why individual study decisions were made.) In certain cases, the discontinuation of studies is justified by conclusory statements that the reader has no means to judge. For instance, peregrine falcon and passerine studies were reportedly terminated because "all data pertinent to assessing injuries had been gathered." Vol. I at 60. If that is true, those data should be reported, or at least summarized, enable meaningful criticism of the decision to discontinue these studies. See also comment below for subtidal study 7.

Thus, not only has there never been any public discussion of the drastic cutbacks in studies conducted in 1990, but now the 1990 studies have been further curtailed. The public has had no chance to influence this process and has no means of offering informed comments on these decisions.

While there may be legitimate, defensible reasons for discontinuing or curtailing certain studies, there are other "reasons" that do not justify such decisions. Perceived budgetary constraints and costs relative to perceived benefits are two such excuses. In our October 30, 1989, comments (at 11), NWF suggested several options to the Trustees for addressing funding needs. Again in our November 30, 1990, comments (at 11), we pointed out that, because all damage assessment costs should be recoverable

from the parties responsible for the EVOS, federal or state budgetary considerations should not drive the damage assessment/restoration planning process. In fact, studies hampered by inadequate budgets may produce data legally insufficient to maintain actions for recovery of those costs. See NWF's 1990 Comments at 11. Yet the Trustees persist in claiming to be "legally obligated to work within the constraints" of the state and federal budgets. Vol. II at D-1. Apparently, the Trustees place this "legal obligation" above their legal obligations to ensure full recovery for the damage to public resources caused by the EVOS and for restoration of the environment.

The 1991 Plan leaves the public in doubt not only as to the justifiability of deleting certain studies, but also as to whether sufficient data are or will be available to make the assessments of injury necessary to recover compensation from those parties responsible for the spill and its effects. Furthermore, in cases where studies have been combined or reorganized rather than eliminated outright, too little (if any) explanation is provided regarding how the new studies and structure relate to and promote the goals and expected results of the predecessor studies. See, e.g., Vol. I at 176 ("subtidal portion [of the coastal habitat field studies] was integrated into the formation of a 1991 suite of studies"); id. at 186-87 (the "new Subtidal category ... includes the former Air/Water studies" and "Subtidal studies 5, 6, and 7 combine elements of 1990 Fish/Shellfish studies 15, 17, 18, and 24"). As a result, the public is ill equipped to assess the logic or workability of the reorganization or to understand the effects of the change.

Restoration Planning

NWF's chief concern regarding the 1991 Plan's treatment of restoration planning is that it disregards entirely the fourth implementation project addressed in the Trustees' March 1, 1991, Federal Register notice--protection of strategic fish and wildlife habitats and recreation sites. As NWF stated in its comments on the Draft 1991 Restoration Work Plan, at 2-5, acquisition or other

protection of critical habitats, particularly steep slopes threatened by clearcut logging, warrants immediate action by the Trustees. Restoration options may be foreclosed if the Trustee Agencies do not act promptly to protect the Prince William Sound region from subsequent assaults on the environment. Indeed, the Trustees acknowledged in their March 1st notice that "[f]ailure to undertake timely restoration may allow damages initiated by the spill to continue or accelerate .... [P]rotection of strategic habitats, subject to land-use changes, can reduce cumulative stresses on injured resources and maintain, in the near term, a full range of restoration options." 56 Fed. Reg. at 8902.

Not only does the 1991 Plan fail to address acquisition of "strategic habitats," it provides no funding for such protective measures. NWF strongly urges the Trustees to revise their restoration plans for 1991 to incorporate an aggressive program to acquire or otherwise protect upland habitats upon which the recovery and future health of the PWS ecosystem may depend. For further discussion of this issue, see NWF's Comments on the Draft 1991 Restoration Work Plan, at 2-5.

NWF has additional concerns regarding the 1991 Plan's treatment of restoration. First, NWF requests an explanation of objective D, in particular the meaning of the clause "in support of the overall natural resource damage assessment process," as it relates to implementing restoration measures. See Vol. I at 277.

Next, the Plan summarizes "preliminary results" of the field studies conducted to date to evaluate the feasibility of certain restoration techniques. Vol I at 277. These "results" were also published in the Trustees' March 1, 1991, Federal Register notice. They are so cursory as to be almost useless. (For example, "results" of the beach wildrye survey work are reported tersely as "indicat[ing] injury to several beach wildrye communities.") The Plan does not state whether these feasibility studies are ongoing or, if not, when more detailed results will be available. In the case of the land status and uses study,

the Plan states that a "second phase is under consideration," Vol. I at 279, but gives the reader no information whatsoever about what is contemplated! Once again, the public is denied a meaningful opportunity to comment on the Trustees' plans for restoration work.

An additional concern has to do with several studies (i.e., monitoring "natural" recoveries, pink salmon stock identification, herring stock identification/spawning site inventory, artificial reefs for fish and shellfish, alternative recreation sites and facilities, historic sites and artifacts, availability of forage fish) that were the subject of 1990 technical support project #3, "Development of Potential Feasibility Studies for 1991." The 1991 Plan merely recites these "topics" and reports that "[f]easibility study proposals are currently under consideration." Vol. I at 279. The reader is left in the dark regarding the extent of results obtained thus far, the status of further study proposals, or timeframes for future activities.

The treatment of restoration planning in the 1991 Plan epitomizes the way in which the Trustees' methods have frustrated rather than facilitated public participation. The Plan states: "[S]ome restoration science studies and implementation projects are being considered in 1991. If these studies or projects are carried forward they will be outlined in a Federal Register notice later this spring." Vol. I at 280. In other words, the public will be informed only when the Trustees have made a decision to proceed (when, of course, any constructive criticism will be pointless); meanwhile, the public is left to speculate what may have been learned from the 1990 feasibility studies and what the Trustees are contemplating as their next step.

The discussion of restoration planning is not only cursory, it is ambiguous. For example, the plan states that "restoration approaches" will be "further evaluated," 1991 Plan at 280, and that "further implementation activities may be recommended," id. at 281. These statements, without more, are mere platitudes; they mean nothing to a reader. The latter pronouncement is particularly baffling. Since no

restoration "implementation activities" have yet been undertaken, NWF is mystified by what is meant by "further implementation activities." The Trustees attempt to bolster the discussion of restoration options in the 1991 Plan by citing the August 1990 Progress Report, see 1991 Plan at 280, but that document does little to supplement the current discussion. If anything, it only raises more questions: For instance, in the August 1990 report the Trustees state that the RPWG "now can begin to organize the ideas suggested [regarding restoration alternatives] and to gather the information necessary to evaluate them." What is the status of that information gathering? Why have the Trustees not informed the public? (Surely they have more to report than the one or two sentences of "preliminary results" for each of the five feasibility studies addressed in the 1991 Plan.) What are the Trustees doing (or proposing to do) to assess the feasibility of the dozens of other restoration options suggested in the matrices in the August 1990 report?

NWF is also puzzled by the discussion of monitoring in the 1991 Plan. While we agree there is a need to monitor the progress of restoration--both natural and assisted recovery efforts--we are at a loss to understand the connection between monitoring and damage claims. See Vol. I at 281. Why should implementation of monitoring wait until after damage claims are resolved? Id.

We are also confused by the budget presented at page 282 and how it relates to the narrative discussion. It is not possible to determine what is meant by "restoration science studies" or how they could be the object of the expenditure of nearly $4 million, especially considering that "some restoration science studies" are only being "considered for 1991." 1991 Plan at 280 (emphasis added). Moreover, the fact that no funds are allocated for implementation projects belies the Trustees' statement at page 280 that implementation projects are being considered in 1991. See also id. at 287 ("implementation projects may be conducted this summer depending on resource availability").

Lastly, NWF is concerned about the narrowness of the scope of restoration feasibility studies conducted to date

and the lack of any indication that the Trustees plan to expand this scope in future restoration planning efforts. In this connection we note that objective D. of fish/shellfish study number 13 calls for identifying "potential alternative methods and strategies for restoration of lost use, populations, or habitat where injury is identified." Vol. I at 155. Because restoration or acquisition of equivalent resources is required for all damaged resources, NWF questions why the bivalve study is singled out in this respect. This objective should be included in the plans for most if not all other damage assessment studies.

NWF is left with the unmistakable impression that the Plan's treatment of restoration planning is mere ostentation. It makes a show of requesting public input that can be nothing but uninformed, too late, and irrelevant. Clearly, the Trustees do not plan to select and design 1991 (or future) restoration activities guided by public comment. And as NWF and others have repeatedly stated, the exercise is doomed by the Trustees' continued failure to make known the results of damage assessment studies. No one can comment intelligently on needed restoration efforts without access to the results of studies undertaken to date to assess the damages resulting from the oil spill to the ecosystem and the services it provides and the feasibility of restoring or replacing those resources/services or acquiring their equivalent. Thus, even if the Trustees' intentions to provide opportunities for meaningful public review are well meaning, without access to the results of damage assessment studies, any public comment is largely worthless.

At this juncture, NWF wishes to reiterate a concern expressed in our comments on the Draft 1991 Restoration Work Plan. We were disturbed by the implication of the Trustees' discussion of a "final restoration plan" in its March 1, 1991, notice in the Federal Register. We refer specifically to the statement: "When the full amount of restoration funds that will be recovered has been resolved, final determinations will be made concerning the nature and scope of the remaining phases of restoration." 56 Fed. Reg. at

8899. It is hard not to construe this as an assumption by the Trustees that restoration needs are expected to exceed the funds available to meet those needs. At best, it suggests that fund recoverability (the amount and timing of funds recovered), rather than damage assessment findings, is driving the restoration planning process. If this is true, the process is malfunctioning. Those parties responsible for the spill are liable for full restoration costs. It would be impermissible to prioritize restoration needs and projects because the Trustees are willing to settle for payment of less than full liability. Restoration needs must be determined on the basis of the damage assessment and economic (contingent valuation) studies. And full disclosure of the results of those studies is essential to meaningful public comment and a properly functioning process.

Availability of Science and Economic Study Data

NWF takes this opportunity to reiterate its oft-repeated, apparently futile plea that the Trustees release immediately the results obtained thus far from NRDA studies, both scientific and economic. Without access to these data and any interpretive analyses, the public is at a severe disadvantage in offering constructive criticism concerning proposed studies and future study needs and in commenting on or suggesting any plan for restoring or enhancing the environment of PWS or acquiring equivalent resources. The Trustees' refusal to release these data, along with their contention that they are under no obligation to make the data available to the public, Vol. II at D-21, renders the entire public participation process a travesty.

Comments On Specific Studies

1) Marine Mammal Study 5. Given the substantial decline in harbor seal numbers in the five years prior to the EVOS, what do the Trustees mean by "normal year" with respect to aerial survey data? Vol. I at 16. Furthermore, how can that statement be reconciled with the statement on the following page that "a single year of post-spill data from 1990 is not sufficient to establish what is normal in a non-oil-spill year"? Id. at 17.

2) Marine Mammal Study 6F. Please explain why no funds are budgeted for salaries for this study.

3) Fish/Shellfish Study 11. The last paragraph of the study plan states: "The major addition to the 1991 herring study is an oil exposure study that will measure the effects of oil exposure on herring eggs and larvae." Vol. I at 153. No further information or explanation is offered. If this is "the major addition" to this study, why is no detail provided?

4) Coastal Habitat Intertidal Study 1A. NWF is concerned by the substantial cut in number of sampling stations--from 97 in 1989-90 to 57 in 1991. Vol. I at 177. Although the Plan attempts to assure the reader that the sampling scheme will allow the detection of injuries and the extrapolation of results, no justification for that pronouncement is offered. The drastic cut in sampling sites, combined with a reduced field season in 1991, renders those assurances suspect.

5) Coastal Habitat Intertidal Study 1B. Given the extensive baseline data available (and the unparalleled opportunities such data present), why did the Trustees decide to cut back post-spill sampling to 16 sites (from an apparent total of 20) and to reduce sampling frequency? It would seem that sampling should be continued at all sites at the same sampling intensities for the valuable data that could be obtained. The Trustees should at least explain their decision to curtail sampling so the public can comment intelligently.

6) Is the above study being coordinated with fish/shellfish study 13 (bivalves)? If not, why? How do the two studies interrelate?

7) Subtidal Study 2. NWF was pleased to read in the description of this study that sampling of benthic populations should be continued for at least five years. Vol. I at 195. But the presence of this recommendation in this study plan points out the absence of a comparable

recommendation in all or nearly all other study outlines. For each damage assessment study, the Trustees should inform the public of their best estimates of the need for and probable duration of future sampling and other studies (acknowledging that such suggestions are tentative and may vary as additional information is gathered). Such information would facilitate the public's review of the current year's plan and provide a basis for evaluating changes in the plans for subsequent years.

8) Subtidal study 7. According to the Plan, this study reflects a substantial reduction in the scope of the precursor 1989-90 studies. The only explanation offered is that "the narrowing of focus reflects findings of the previous two years, and is aimed at continuing only those portions of the study which are most likely to assist in documentation of injury." Vol. I at 237. The reader is left to wonder what the previous years' findings were, and why the deleted portions of the former studies were less likely to document injury. For example, is the reason for the latter the absence of discernible injury outside PWS, inappropriate study design, or some less obvious answer?

9) Scientific Peer Reviews. NWF cannot determine from this outline whether peer reviewers including a Chief Scientist have already been designated and have been reviewing 1989-90 study plans and data, or if this review has not yet commenced. If the review has not yet begun, NWF urges that it be undertaken immediately. To the extent peer review input can be obtained before studies commence, it should be incorporated in 1991 study plans. We also have questions about the budget. First, the budget shows sources of funds but not the purposes or objects of the expenditures. Is personnel/salaries the only cost of this part of the NRDA program? The budget also raises some question as to whether NOAA will be a net contributor to this program or whether its expenditures will be reimbursed by the federal Trustees.

10) Economics Study 5. NWF reiterates its comments concerning this study as described in the 1990 Plan. In particular we urge the Trustees to ensure that damages are not underestimated as a result of developing single-type

categories of recreationists, thus overlooking that fact that, for example, kayakers also fish and camp and often use charter boat services. The Trustees recognize this in the introduction, but it is not clear from the description of methods that this phenomenon will be reflected in the models developed.

11) Oil Spill Public Information Support. The funds allotted to this project seem grossly overinflated unless the Trustees sincerely intend to begin making NRDA study-related data available in 1991. What precisely is meant by the "OPSIC [sic] will begin to catalog scientific data from the EVOS during 1991"? Does "catalog" mean enter into a computerized data base? If so, will such data be available as soon as it is entered? What kind of indexing system will be provided to assist the public in identifying and retrieving information? How and to what extent will the Trustees' views about litigation-related constraints on releasing scientific and economic study limit the usefulness of the OSPIC?

Miscellaneous Comments

1) Response to NWF Comment, Vol. II at D-19. NWF has advised the Trustees of its view that NEPA is applicable to the NRDA and restoration planning process. Consequently, the Trustees have proposed to consider NEPA with respect to future restoration projects. See Vol. II at D-19. There is no justification, however, for excepting NRDA studies from NEPA's purview.

2) The 1991 Plan is an improvement over earlier editions of this document in that it elucidates the assumptions upon which certain studies and study designs were based. However, these assumptions are not explained, nor have the Trustees given the reader any means to assess the reasonableness of the assumptions.

3) NWF notes that study objectives are not uniformly presented in terms of testing a null hypothesis. In a few cases where an objective is presented in terms of testing a hypothesis, the hypothesis is stated as whether a particular

change or difference is due to EVOS (as opposed to the classic null hypothesis that assumes an observed difference is attributable simply to chance). Perhaps the peer reviewers should consider whether these discrepancies may be significant in affecting study design or impairing the scientific or legal value of the results of the NRDA studies.

Conclusion

NWF appreciates this opportunity to comment on the 1991 Plan and commends the Trustees for their efforts to obtain public input earlier in the season than in prior years and for the enhanced detail and scientific credibility of the Plan. However, NWF remains deeply concerned that the effectiveness of public participation is still greatly limited by the timing of the release of the Plan and by the continuing refusal of the Trustees to release all scientific and economic data and analyses thereof. NWF also deplores the Plan's narrow view of restoration options and planning, and especially the failure to pursue the option of acquiring equivalent resources in need of protection. Lastly, NWF is disturbed by the pattern of eliminating and curtailing studies from year to year, particularly in light of the absence of any meaningful explanation of those decisions and the Trustees' apparent views regarding the cost effectiveness of certain studies and budget constraints.

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RALPH H. PALUMBO
PARTNER

May 31, 1991

File: 10293-0007

VIA FEDERAL EXPRESS TO TRUSTEE COUNCIL

Trustee Council
U.S. Forest Service
Federal Building, Room 545
709 West 9th Street
Juneau, Alaska 99801

Re: 1991 State/Federal Natural Resource Damage Assessment and Restoration Plan for the Exxon Valdez Oil Spill

Dear Trustee Council:

Enclosed are Alyeska Pipeline Service Company's comments on the 1991 State/Federal Natural Resource Damage Assessment and Restoration Plan for the Exxon Valdez Oil Spill.

Sincerely,

HELLER, EHRMAN, WHITE & McAULIFFE

Andrew W. McKenzie

for Ralph H. Palumbo

Enclosure

ALYESKA PIPELINE SERVICE COMPANY'S COMMENTS ON

THE 1991 STATE/FEDERAL NATURAL RESOURCE DAMAGE ASSESSMENT AND RESTORATION PLAN FOR THE EXXON VALDEZ OIL SPILL

Comments Submitted to Trustee Council
June 3, 1991

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I. INTRODUCTION

Alyeska Pipeline Service Company ("Alyeska") submits the following comments on the "1991 State/Federal Natural Resource Damage Assessment and Restoration Plan for the Exxon Valdez Oil Spill" (the "1991 Plan").

Two years have passed since the Exxon Valdez oil spill. Alyeska continues to remind the State of Alaska and federal government trustees (the "Trustees") that Alyeska did not cause the Exxon Valdez oil spill nor is it liable for damages to natural resources caused by the spill. Nonetheless, the Trustees continue to ignore the clear language of the Clean Water Act ("CWA") and continue to identify Alyeska as a "potentially responsible party" ("PRP").

Alyeska supports performance of a valid assessment plan that will identify requirements for the cost-effective restoration of Prince William Sound. As stated in Alyeska's comments on the previous two NRDA Plans, the process by which the Trustees are conducting the NRDA is legally and scientifically deficient. Those same deficiencies continue in the 1991 Plan. As was true with the 1990 Plan, the 1991 Plan again fails to correct the deficiencies in its predecessor plan. The Trustees have failed to follow the Department of Interior's NRDA Regulations, 43 C.F.R. Part 11 ("DOI Regulations"); the Trustees continue to withhold essential information and data; the Trustees do not follow disciplined procedures or use methods designed to produce a valid assessment; the Trustees continue to deny the PRPs participation in the assessment process; the Trustees continue to deny the PRPs and the public meaningful opportunity to comment on the assessment; and the 1991 Plan continues to use the wrong measure of damages and ignores restoration.

Once again, the Trustees seek comment on the NRDA plan but fail to make available the information necessary for meaningful public comment. Without access to data from the prior years' studies, the public cannot assess the scientific validity, cost-effectiveness, or legal justification for the proposed studies. This opportunity to comment is little more than a perpetuation of the fallacy that the Trustees seek meaningful public participation in the NRDA process.

II. SPECIFIC COMMENTS

A. THE TRUSTEES HAVE WITHHELD ESSENTIAL INFORMATION AND DATA NECESSARY FOR MEANINGFUL PUBLIC COMMENT

For the public and the PRPs to determine whether studies proposed for 1991 are scientifically valid, legally justified, and cost-effective, the Trustees should have made available the results from the past years' studies. In spite of deafening public criticism, the Trustees still refuse to disclose any of these results. Without access to the results of prior studies, it is impossible to comment meaningfully on the proposed studies.

The need for meaningful public comment as part of the NRDA process is hardly a radical suggestion. The preamble to the DOI Regulations explicitly recognized,

> The public has a right to review and comment on decisions at appropriate points in the [NRDA] process. Indeed, members of the public serve a valuable role by providing input, raising concerns, and performing critical reviews.

51 Fed. Reg. 27703 (Aug. 1, 1986). The proposed revisions to the DOI Regulations also recognize the need for early and full public involvement. For instance, DOI's proposed new NRDA regulations expressly require public involvement before implementing the assessment plan. See 56 Fed. Reg. at 19754.

Only by reviewing the data from prior studies can the public assess whether future studies are warranted or whether past studies should continue. By withholding the data essential for reviewing the 1991 Plan, the Trustees have made the public's right to review and comment a meaningless exercise. Even assuming that the Trustees have the discretion to withhold data (which they do not), their withholding of data for over two years -- without any articulated justification other than "scientific practices and litigation concerns" -- is completely unjustified.

B. THE TRUSTEES REFUSE TO ALLOW THE PRPS ANY MEANINGFUL PARTICIPATION IN THE ASSESSMENT

In spite of the clear mandate of the DOI Regulations, the Trustees continue to ignore the role of the PRP in the NRDA process. See 43 CFR § 11.32(a)(2)(iii); 50 Fed. Reg. 52,128 (Dec. 20, 1985). The D.C. Circuit, in Ohio v. Dept. of Interior, 880 F.2d 432 (D.C. Cir. 1989), emphasized the PRPs special role in the NRDA process, stating, "PRPs merit more involvement in the preassessment process than does the general public because PRPs

have a stake in the cost-effectiveness of the assessment methods chosen." 880 F.2d at 468. Nonetheless, the Trustees have refused even to share assessment study data with the PRPs.

In response to numerous comments complaining about the failure to make data available to the PRPs, the Trustees have stated that the DOI Regulations leave it to the Trustees' discretion to determine the manner and timing for the release of data. 1991 Plan at D-20 to D-21. For this proposition, the Trustees cite to 43 C.F.R. § 11.31(a)(4), which dictates the level of detail for assessment plans and states,

> The Assessment Plan shall contain procedures and schedules for sharing data, split samples, and results of analyses, when requested, with any identified potentially responsible parties and other natural resource trustees.

43 C.F.R. § 11.31(a)(4) (emphasis added). The regulation mandates that the Trustees include procedures and schedules for sharing the information. Now, after two years and three NRDA Plans, the Trustees have still not complied with the very regulations they cite for their discretion. Even assuming that the Trustees have the discretion to determine when and how to release data and samples, they do not have the authority to withhold the information completely.

C. THE TRUSTEES WILL NOT CONSIDER PUBLIC COMMENT UNTIL AFTER THE 1991 STUDIES HAVE BEGUN

The Trustees claim that they "will consider public comments received [on the 1991 Plan] prior to commencement of the 1991 studies." 1991 Plan at D-18. Given that the 1991 Plan was not published until April and that the public comment period closes on June 3, it is specious for the Trustees to even suggest that they will consider comments prior to commencing the 1991 studies. Most, if not all, of the 1991 studies have already begun. By commencing the 1991 studies before considering the comments on the studies, the Trustees have made clear that public input into the assessment is a meaningless formality.

D. THE TRUSTEES CANNOT WITHHOLD SCIENTIFIC RESULTS BECAUSE OF POTENTIAL LITIGATION

For almost two years, the Trustees have withheld access to the scientific data critical to public review of the assessment. The justification for doing so has been a vague claim that the information is "litigation sensitive." The fact that data might be relevant to potential litigation is no basis for withholding

that information and subverting the entire NRDA process. The bulk of the withheld information is raw scientific data, none of which can be protected from discovery in any subsequent litigation. The data is not protected by the work-product doctrine, the attorney-client privilege, or the deliberative process privilege. On the contrary, the DOI regulations and the Ohio decision mandate that the information is to be released as part of the assessment.

If the Trustees were able to withhold data based on a "litigation sensitive" claim, then the government could shroud every NRDA action in this cloak of secrecy since every NRDA action would have the potential of litigation. The Trustees' "litigation sensitive" excuse subverts the open, public process envisioned by Congress and by the DOI Regulations. As trustees for the public natural resources in Prince William Sound and in Alaska, the Trustees have an obligation to the public to release the results of all the studies conducted to date and all future studies.

E. THE TRUSTEES HAVE FAILED TO FOLLOW THE NRDA REGULATIONS

For the reasons stated in Alyeska's comments on both prior plans, the Trustees are bound to apply the DOI Regulations. Yet the Trustees are conducting this assessment on a wholly ad hoc basis. Nothing in the CWA or CERCLA suggests that the Trustees can ignore the DOI Regulations. Even if the Trustees had discretion to vary from the Regulations (which they do not), the Trustees have provided no justification for deviating from regulations which by definition are the "best available procedures" and which are to be updated biennially to assure they remain the "best available". 42 U.S.C. § 9651(c)(1). The DOI regulations provide a logical, standardized process for conducting a fair, valid, and cost-effective assessment. The Trustees' decision to depart from the best available assessment procedures established by the DOI Regulations is unlawful and will cause the final assessment to be scientifically invalid and legally indefensible.

The Trustees' failure to follow the DOI Regulations also strips the assessment of the rebuttable presumption. Contrary to the Trustees' suggestion (see 1991 Plan at D-2), the rebuttable presumption is not available to the Trustees if they selectively apply the DOI Regulations. In the preamble to the final regulations, DOI stated,

> It is the dollar figure representing the damage assessment that is entitled to a rebuttable presumption, rather than the choice of methods for arriving at the dollar figure. . . . The rebuttable presumption does

> not necessarily attach to each individual decision as to the proper application of methodologies allowed.

51 Fed. Reg. at 27694 (Aug. 1, 1986). Thus, the Trustees cannot selectively apply the DOI regulations.

F. THE 1991 PLAN FAILS TO FOCUS ON RESTORATION COSTS

Alyeska's comments on the two prior NRDA plans emphasized the Trustees' failure to focus on restoration as required by the CWA, the DOI Regulations and the Ohio decision. The 1991 Plan suffers the same defect and even exacerbates it. Under the CWA, the only damages recoverable are those costs actually incurred in the restoration or replacement of the damaged natural resources. The Trustees cannot recover lost use and non-use values. The Trustees can only conduct studies that will lead to a determination of the restoration costs of the injured natural resources.

Nonetheless, the 1991 Plan continues many economic studies designed to assess damages that are not compensable under the CWA and even adds further studies, such as the economic study of petroleum price increases. Since these studies purport to study damages that are not recoverable under the CWA, they must be discontinued.

G. THE 1991 PLAN SEEKS TO MEASURE DAMAGES THAT ARE NOT RECOVERABLE AS NATURAL RESOURCE DAMAGES

Under the CWA and the DOI Regulations, the Trustees can recover damages only for injury to natural resources. The Trustees cannot recover damages that are not natural resource damages. Nonetheless, the Trustees plan to study and presumably will seek to recover damages unrelated to natural resources. For instance, the Plan includes nearly $3 million to fund the Oil Spill Public Information Center ("OSPIC"). The OSPIC has nothing to do with the assessment of damages to natural resources and cannot be justified as part of the assessment. The 1991 Plan adds a new study relating to the impact of the Exxon Valdez spill on the price of gasoline on the West Cost of the United States. This study has nothing to do with damages to any natural resources. The Trustees also plan to continue a study of damage to archeological sites. Archeological sites are not natural resources as defined by either CERCLA, the CWA, or the DOI Regulations and cannot be studied as part of the assessment. The Trustees' inability to confine the NRDA process to the statutory and regulatory requirements of the CWA makes the need for adherence to the DOI Regulations even more acute.

H. THE 1991 PLAN CONTINUES STUDIES WHERE NO INJURY HAS BEEN DOCUMENTED

In spite of admissions from the Trustees that certain resources showed no conclusive evidence of injury, the Trustees are continuing studies of those resources. For instance, the Trustees have admitted for the brown bear study that "no conclusive injury has been document" (56 Fed. Reg. at 14690 (Apr. 11, 1991)), and for several species of coastal and offshore fish "significant injury has not been documented" (id. at 14692).

If there is no injury to these resources as defined by the acceptance criteria of 43 C.F.R. § 11.62, then these studies must be stopped. Continuation of these studies is unjustified and violates the DOI Regulations. Because the Trustees have failed to release the necessary data, the public and the PRPs can only speculate what other natural resources have shown no evidence of injury and would not meet the acceptance criteria of the DOI Regulations. The Trustees must release the information critical to making these determinations.

I. THE SCIENTIFIC PEER REVIEW PROCESS IS INADEQUATE

Impartial peer review is critical for assuring the scientific validity of the assessment. Peer review enables independent analysis and evaluation of studies. It ensures the flow of information among scientists. It serves as a watchdog against fabricated or unreliable data. The peer review procedures outlined in the 1991 Plan are inadequately described and appear to compromise the impartiality of the reviewers. From the description, it appears that the peer reviewers will not be independent, impartial scientists but instead will be hired experts charged with defending the validity of the NRDA studies, including defending the studies in court as expert witnesses. Because the peer reviewers have been selected by and are compensated through the Trustees, the fairness and objectivity of the peer review process and the assessment is fundamentally compromised.

III. CONCLUSION

The Trustees have failed to establish an open, accessible, scientifically-valid and legally-justifiable assessment of the damages to natural resources resulting from the Exxon Valdez oil spill. Once again, the Trustees have sought comment on this wholly inadequate assessment plan as if subjecting it to public comment will somehow validate all its deficiencies. Public comment will not cure the 1991 Plan -- or the entire assessment -- of its deficiencies. Without access to the data, samples, and results from all prior studies, the PRPs and the public cannot

assess the scientific validity of the assessment, monitor the cost-effectiveness of the assessment, or participate in the assessment in any meaningful way.

Further, it is critical that the assessment process comply with the CWA and the Regulations. The Trustees cannot hope to defend an assessment that so grossly deviates from the statutes and regulations. The assessment process used to date is fundamentally flawed -- legally, scientifically and economically.

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G. William Frick
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May 31, 1991

Trustee Council
P.O. Box 22755
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Re: 1991 State/Federal Natural Resource Damage Assessment and Restoration Plan for the Exxon Valdez Oil Spill, 56 Fed. Reg. 14346 (April 9, 1991)

Dear Council Members:

The American Petroleum Institute (API) welcomes the opportunity to comment on the 1991 NRDA Plan for the Exxon Valdez oil spill. API is a national trade association whose corporate and individual members are engaged in all facets of the petroleum industry. Many API members conduct operations which might expose them to potential liability for natural resource damages under the Federal Water Pollution Control Act. As such, API's members have a direct interest in the propriety of studies undertaken by the trustees in this assessment.

As the attached, specific comments indicate, the trustees' failure to disclose data gathered in their previous studies seriously constrains API's ability to comment upon the need for continuing or additional studies. In addition, API questions whether there are valid legal bases for the natural resource trustees' speculative inquiries regarding potential private economic losses. There continues to be a lacking correlation between many of the studies, as described, and the determination of compensable natural resource damages. API urges the trustees to consider its observations and recommendations as they proceed to fulfill their challenging legal and environmental obligations.

Sincerely,

G. William Frick

GWF:syc

COMMENTS
OF THE
AMERICAN PETROLEUM INSTITUTE

ON THE 1991 STATE/FEDERAL NATURAL RESOURCE DAMAGE ASSESSMENT AND RESTORATION PLAN FOR THE EXXON VALDEZ OIL SPILL

Trustee Council; April, 1991
56 Fed. Reg. 14346 (April 9, 1991)

Submitted
May 31, 1991

For More Information Please Contact:

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COMMENTS OF THE
AMERICAN PETROLEUM INSTITUTE
ON THE 1991 STATE/FEDERAL
NATURAL RESOURCE DAMAGE ASSESSMENT AND
RESTORATION PLAN FOR THE EXXON VALDEZ OIL SPILL

Trustee Council; April, 1991
56 Fed. Reg. 14346 (April 9, 1991)

The American Petroleum Institute (API) submits the following comments on the "1991 State/Federal Natural Resource Damage Assessment and Restoration Plan for the Exxon Valdez Oil Spill," (1991 Study Plan) prepared by the Trustee Council and dated April, 1991. API in its comments filed on the 1989 and 1990 assessment plans, pointed out that the prior plans: (1) inadequately addressed the methods for the restoration of natural resources; (2) failed to study the natural recovery of exposed resources; and, (3) studied alleged injuries to "resources" that were not encompassed in the applicable statutes and regulations. ~~The 1991 Study Plan, while indicating that many studies have been completed, continues to reflect overreaching by the Trustees to study inappropriate resources or to search for injuries that are unlikely to have resulted.~~

In the comments which follow, API reviews and comments upon the 1991 studies for evaluating potential injuries to natural resources and for quantifying any damage to the resources. In particular, API notes:

- ~~The Trustees continue to issue study plans that will be largely complete before there is any opportunity for an evaluation of public comment;~~
- ~~The Trustees' unwillingness to release the data gathered in previous years makes it nearly impossible to comment upon the need for continuing specific studies or whether additional studies are appropriate;~~
- ~~Funds should not be spent to study archeological sites, alleged price increases in petroleum products, or to create oil spill libraries, because such efforts are beyond the legal authority of the Trustees;~~
- ~~The use of peer reviewers must be more adequately explained, specifically how the process will be useful and unbiased; and,~~
- ~~Many studies are being continued without any consideration of whether the resources can be restored, rehabilitated or replaced, or whether such studies are necessary in light of the considerable natural restoration that has already occurred in the oil impacted areas of Prince William Sound (PWS).~~

API has also included comments on the Trustees' "Response to Public Comments" (Response to Comments) contained in Appendix D of the 1991 Plan. Though some of the responses appear to be based upon actual data or information, many of the responses provide no objective support for their conclusions. API and other commenters have made a genuine effort to make constructive recommendations to the Trustees and such comments should not be treated in an unresponsive fashion. 7

API urges the Trustees to release the results of the prior studies and to allow commenters another opportunity to provide input. The damage assessment process envisioned in the Department of Interior regulations (DOI regulations) need not be an adversarial enterprise, but it would appear that the Trustees' concerns as litigants have resulted in the withholding of considerable information that would be of great utility in providing meaningful public review and comment. 8

TRUSTEES CONTINUE TO LIMIT THE OPPORTUNITY FOR PUBLIC COMMENT

The Trustees propose to extensively study the potential impacts of the Exxon Valdez Oil Spill (EVOS) for a third year. Once again, the study descriptions are not available for comment prior to study initiation. Accordingly, the Trustees will be unable to consider, much less implement commenters' suggestions, even if the recommendations are deemed to be valid, now that many of the studies have been initiated. API maintains that the Trustees have yet to provide interested parties with meaningful opportunities for public comment. 9

Assurances that comments on the 1990 plan may have been considered in preparing the 1991 plan provide no justification for the continued tardiness of the Trustees. The inference to be drawn from the Trustees' actions is that pre-decisional comments are really not being solicited. Indeed, other actions of the Trustees call into question the openness of the process and the willingness of the Trustees to fairly evaluate the input of interested parties. 10

For example, many of the studies planned for 1991 are a continuation of studies identified in the 1989 and 1990 plans. A number of these studies were significantly criticized by commenters in prior comments. API has reviewed the response to comments issued with regard to the comments received on the 1990 plan. Over the course of the 178 pages of the Trustees' responses, only five of the comments that disagreed with aspects of the Trustees' plans were credited with any validity. [1] This includes comments received from industry, environmental groups, and academic

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[1] See pages D-7, D-31, D-54, D-54, and D-64 of the Response to Public Comments (Appendix D).

institutions. Given the often very technical nature of many of these comments, API seriously questions whether this input was given fair consideration by the Trustees.

Indeed, an inspection of selected responses contained in the response to comments reveals an often cavalier disregard of these recommendations. For example, commenters questioned the adequacy of the certain studies or portions of studies. The typical response, though, was not a factual refutation of the comment, but rather a wholly unresponsive statement that the study was "adequate." Regardless of whether such a response complies with 5 U.S.C Section 553 of the Administrative Procedure Act that requires federal agencies to provide explanations for their actions, such responses do little to foster confidence in the even-handedness of the process.

API recognizes that a lack of data often forced commenters to speculate about the exact nature of some of the studies. But, to this extent, the blame cannot lie with commenters. Interested parties functioned in a data vacuum. Results of the 1989 and 1990 studies were not released by the Trustees, purportedly for litigation reasons. In addition, the study descriptions often were very general and lacked key information that would have assisted commenters in assessing their utility and expected accuracy.

In making these observations, API is not trying to resurrect its prior complaints. To the contrary, API continues to participate in this process in an effort to provide useful suggestions, but finds it very difficult to be more constructive in its recommendations due to a lack of information generated by the on-going and newly planned studies and the fact that many of its comments will be after-the-fact. In effect, the only information released regarding the studies is contained in the Trustees' summary filed with the court and published in the Federal Register. See 56 Fed. Reg. 14687 (April 11, 1991). Although there are some useful observations contained in this report, it falls far short of the more detailed data and analysis that had to have been gathered to allow its preparation. None of the materials have been made publicly available.

API submits that interested parties have yet to be offered a meaningful opportunity to comment on the assessment plans. This deprivation is inconsistent with the Department of Interior's damage assessment regulations and, as a practical matter, has been detrimental to the development of sound, cost-effective studies of potentially affected natural resources. API renews its request that the Trustees provide ample lead time and information to allow all interested parties to participate meaningfully in the process.

TRUSTEES' LACK OF COMPLIANCE WITH THE DOI REGULATIONS

Trustees May Not Selectively Follow the DOI Regulations

In the Response to Comments, the Trustees continue to assert that compliance with the DOI NRDA regulations is optional, citing the language of 43 C.F.R. Section 11.10. While API recognizes that the DOI has stated that the use of the Type A and B regulations is not mandatory, API strongly disputes the Trustees' suggestion that the Type B regulations are analogous to a "cafeteria" whereby Trustees can pick the provisions they like and ignore the rest and still have the benefit of a rebuttable presumption on the provisions they purported to select. [2/] The Trustees have seriously misconstrued the DOI regulations in this regard.

The Trustees appear to believe that the rebuttable presumption provided in CERCLA Section 107(f)(2)(C) attaches on a study-by-study or decision-by-decision basis, i.e., if the Trustees follow the DOI provisions for a particular study, then the presumption would apply to the study, while where the Trustee deviates from the regulations, the presumption would not be available only for that study. But this interpretation is directly contradicted by the preamble to the Type B damage assessment regulations.

According to DOI, the rebuttable presumption attaches to the final damage determination rather than individual studies conducted along the way. Therefore, in order to obtain the benefit of the rebuttable presumption for the final determination, the Trustees must be able to show they complied with the "best available" procedures identified by DOI during the assessment process:

> Another comment suggested that the Department clarify whether the rebuttable presumption applies to the trustee's choice of methodologies and their application, or only to the (final dollar) assessment. It is the dollar figure representing the damage assessment that is entitled to a

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[2/] In the Response to Public Comments, the Trustees include the following comment and response at p. D-2:

> Comment: The Trustees may not pick and choose from the NRDA regulations on an issue-by-issue basis (ESC).
>
> Response: The Trustees disagree. The NRDA regulations are optional, and their use is within the discretion of the Trustees. See 43 C.F.R. § 11.10. There is no requirement that the Trustees must choose to employ the regulations on an all-or-nothing basis.

rebuttable presumption, rather than the choice of methods for arriving at the dollar figure. The rebuttable presumption attaches to the dollar figure, however, only if it has been derived in accordance with proper application of the methodologies in the rule. The rebuttable presumption does not necessarily attach to each individual decision as to the proper application of methodologies allowed. [3/]

Moreover, other statements in the preamble demonstrate that strict adherence to the specific DOI procedures is integral to receiving the rebuttable presumption:

> The criteria for what constitutes a measurable injury are strict. This stringency reflects the determination by the Department that these criteria provide for the best available procedures and reflect the fact that Federal trustees will receive a rebuttable presumption for the assessments performed pursuant to this rule. [4/]

Indeed, DOI defended the fairness of the rebuttable presumption because of the need to adhere to the established procedures:

> One comment maintained that the ... rebuttable presumption raises concerns about due process because the trustee is given virtually unlimited discretion to fix the amount of the damage assessment and is protected by the rebuttable presumption provision. The Department believes that the assessment process required in the rule ensures that the authorized official's discretion is not unlimited and that the damage assessment will be reasonable. Therefore, the rule does not deny due process. [5/]

DOI's position on this matter is sound. If the final determination is to be given the benefit of a presumption of accuracy, then it must be based upon the "best available" procedures (as identified by DOI) at each step of the process. Trustees could not be allowed to selectively follow the DOI procedures or to substitute alternate criteria, otherwise the end result could not be presumed to be accurate. Indeed, in dealing with this question with regard to the Type A procedures, which

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[3/] 51 Fed. Reg. 27694, col. 2 (August 1, 1986).

[4/] Id. at 27682, col. 3.

[5/] Id. at 27694, col. 1.

involved the use of a computer model and accompanying data bases, the DOI clearly stated that Trustees would not be allowed to substitute data:

> The Department agrees that no input to the PHYSCHEM data base should be permitted. The results of this type A assessment will be accorded a rebuttable presumption, therefore, data that have not been reviewed should not be used in the NRDAM/CME. The Department also agrees that any future Departmental changes in any data base are subject to the Administrative Procedure Act, since the NRDAM/CME and its data bases are incorporated by reference in this final rule. Therefore, the public is assured that interested parties will be provided an opportunity to comment on any proposed changes. [6]/

API maintains that the Trustees have misintepreted the DOI regulations to support their contention that selective compliance with the regulations is permissible. DOI statements are straight-forward and unambiguous that the rebuttable presumption applies to the end result of the assessment process and can only be obtained by compliance with all the requirements of the DOI regulations. [7]/

Trustees' Interpretation Contradicts the Congressional Intent

The DOI regulations were intended to function as a unit with each step in the process leading logically to the next. Such an approach was deemed necessary by the DOI to fully implement the intent of Congress. By selectively ignoring portions of the regulations, the Trustees have clearly deviated from the approach that Congress expected Trustees to follow to achieve the legislative goals.

First, as briefly mentioned above, Congress required that the DOI identify the "best available" assessment procedures. The use of these procedures would be the basis for a Trustee obtaining a rebuttable presumption that the results of the assessment were accurate. To a large extent, DOI has met this legislative directive and the "best available" procedures identified by DOI have been subjected to rigorous public scrutiny and judicial review. Therefore, the Trustees' choice of a set of procedures other than the "best available," at the least, imposes a duty on the Trustees to explain why the DOI procedures are inappropriate. The Trustees never

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[6]/ 52 Fed. Reg. 9089, col. 1 (March 20, 1987).

[7]/ Even though certain aspects of the regulations are currently subject to change in light of the Ohio v. Department of Interior decision, 880 F.2d 481 (D.C. Cir. 1989), no court has endorsed the notion that the rebuttable presumption conferred by compliance with the regulations can be carved-up on an issue-specific basis.

answer this question, and the decision to reject portions of the DOI regulations is unreasonable and conflicts with the Congressional intent of using the best available assessment procedures.

Second, Congress called for the identification of assessment procedures to create "a standardized system for assessing ... damage which is efficient as to both time and costs." [8]/ The DOI regulations clearly reflect this concern for efficiency in numerous areas, including a requirement that the assessment costs be reasonable. API maintains that by deviating from the DOI procedures, the Trustees have conducted unnecessary or overly broad studies that have not been an appropriate use of funds.

Third, one of the other reasons that Congress required DOI to develop the new regulations was a desire to ensure fairness: "Investigations by the Committee ... revealed the need for an improved, fair, and expeditious mechanism for dealing with natural resource damages." [9]/ Although no set of regulations is perfect (indeed, Congress requires a biannual review of the DOI regulations to ensure they remain up-to-date and are the "best"), the DOI regulations contain a number of mechanisms such as pathway determinations, objective injury standards, reasonable cost requirements, and public comment, that help to make their use fair to all parties. In departing from this scheme, API believes that the Trustees have introduced considerable unfairness into the process.

The DOI regulations were intended to accomplish the Congressional objective of a standized set of efficient and fair procedures. By deviating from the DOI regulations, the Trustees have compromised achievement of these goals and undermined the credibility of the assessment of damage. This decision is all the more perplexing because the Trustees have yet to advance any objective reason for this course of action.

Trustees Continue To Undertake Inappropriate Projects And Studies

In previous comments, API noted specific studies or projects that are not appropriate under the Clean Water Act or the DOI regulations. For example, API strongly objected to the studies planned to address archeological sites that may have existed prior to or been found in Alaska since the cleanup of the EVOS. Although artifacts and other historic relics may have scientific and educational interest, they are simply not natural resources as that term is defined in either the CWA or

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[8]/ See S. Rep. 848, 96th Cong., 2d Sess. 85 (1980).

[9]/ Id.

CERCLA. API is therefore disappointed to see that these studies are slated to be continued in 1991 rather than terminated or pursued using alternative funding. [10]/

API is also dismayed to see that the Trustees have proposed to initiate additional studies for which there is no authority. For example, Economic Study Number 10 purports to evaluate alleged economic damages to the consumers of petroleum products associated with the EVOS. A total of $271,300 is planned for this study, but like the archeological studies, no natural resource is cited as being injured. Moreover, the study description admits the speculative nature of the study: "If it appears that a connection between the two events [the spill and price increases] can be shown, the damage to consumers ... will be estimated." 1991 Study at p. 274. Such statements are indicative of the Trustees' approach with many studies, i.e., spend money in the hopes of finding a rationale that would provide some support for a damage recovery. [11]/

API is similarly concerned with regard to the funding of the Oil Spill Public Information Center. The study description states that the Center disseminates information about "oil spills in general and the Exxon Valdez oil spill in particular." 1991 Study at p. 275. Nearly $3 million dollars is planned to be spent to catalogue information and to meet Freedom of Information Act requests.

The Trustees cite no legal authority for the creation of such a Center. The Center does not represent a cleanup activity, an assessment of natural resource damage, or the replacement, rehabilitation, or acquisition of natural resources. Although the Center may provide services to the public, this is not a resource that was injured by the spill or an appropriate subject for a damage assessment study. API maintains that the Center must be funded on an alternative basis.

Finally, like the Spill Center, API believes that the Trustees lack the authority to conduct Bird Study No. 1, which constitutes a expensive inventory of bird carcasses collected during clean-up and study operations. This study is not designed to either determine resource injury or to conduct restoration actions. Instead, its stated intent is to foster access to these dead birds by academic and other research institutions. Again, although there may be some legitimate interest in these birds by researchers, there is simply no authority for financing such a project in accordance with applicable legal authority.

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[10]/ The Trustees' response to commenters that archeological sites and other man-made artifacts is unconvincing and cites no legal authority except a stilted reading of the CERCLA definition of a "natural resource."

[11]/ The problems with the petroleum products price study are discussed in greater detail in these comments at p. 10.

More Information Regarding Peer Review Is Needed

In general, API supports the use of peer review groups to evaluate the credibility of scientific studies. However the Trustees' use of peer review as a part of this assessment raises a number of questions that should be addressed. First it appears that the peer review process is intended to validate the Trustees' assessment plan. Expert comments and reviews of the technical details of individual studies do not address the need for, and validity of, the overall program. An effective peer review would look at the overall process being implemented and make judgments within the context of the statutory requirements for restoration. Had this broader review been implemented, it is unlikely that the science-oriented program would have continued virtually unchanged from prior years.

Second, beyond this broad concern API notes that the Study Plan does not identify the method by which peer reviewers were selected, their qualifications, their affiliations, whether steps have been instituted to guarantee the impartiality of the peer review groups or even the identity of the peer reviewers.

Third, the Study Plan does not explain why over $2.5 million dollars is needed for this peer review process. API assumes these peer reviewers are being compensated for their services, but often peer review can be accomplished through scientific organizations or academic institutions at far lower costs. Indeed, the peer reviewers' compensation, on its face, raises a question about the impartiality of the reviewers' services.

Finally, the Study Plan does not indicate whether peer review reports will be publicly available and open for additional comment. It would appear from statements made in the Study Plan and the Response to Public Comments that peer reviewers have already been consulted and have provided input into specific studies. However, other than these vague references, no reports or other information generated during this peer review has been made available.

API believes that peer review can be a useful tool, but only if it is employed to achieve a fair and even-handed process. The Trustees must provide more information about the makeup and duties of the peer review groups, including the procedures being employed to ensure their impartiality.

Several of the Economic Studies Are Problematic

By and large, the descriptions of the economic studies are very vague and fail to provide a reviewer with sufficient information to evaluate their scope. For example, Economic Study No. 7 indicates that "Intrinsic Value Losses" will be determined; however, it is not apparent whether this study could lead to double-counting due to the valuation estimates derived from other studies such as recreation

uses. Moreover, API continues to question the reliability of using contingent valuation to measure alleged non-use losses. The Trustees, by continuing to withhold information and presenting vague study descriptions, have done little to allay these concerns with the use of contingent valuation for such resources.

Second, API is particularly concerned with studies that attempt to quantify secondary or indirect damages to private parties. For example, the new study to measure the possible impact of the EVOS on the price of petroleum products on the West Coast has a number of problems, including the failure of the Trustees to describe a natural resource that has been injured. The Trustees do not properly employ their assessment authority when they pursue such alleged losses. In this regard, API is not alone in its concerns. In a recent notice containing proposed revisions for the damage assessment regulations, DOI stated:

> ... compensable value would not include any private economic damages related to the secondary or indirect economic effects on individuals, businesses, or other non-governmental organizations associated with a discharge or release, and the associated cleanup activities. For example, an oil spill may have regional economic impacts that cause some private businesses to grow ... and others to diminish .... Although private individuals might gain or lose money as a result of these activities, the losses cannot be included in compensable value because they are not covered in the natural resource damage provisions of CERCLA. [12/]

In addition to the study of petroleum prices, API also believes that the subsistence loss study, Economic Study No. 6, addresses losses incurred by private individuals and therefore, is beyond the scope of the damage assessment authority of the Trustees. At a minimum, the Trustees must identify a public use of the resources and how private uses will be excluded to prevent double-counting.

API also continues to believe, as stated in its earlier comments, that the alleged losses to research programs are not appropriate subjects for this assessment. Not only should these alleged private losses be asserted by the parties conducting the research, the losses are speculative since there is no assurance that many of these

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[12/] 56 Fed. Reg. 19760, col. 3 (April 29, 1991). See also Proposed Section 11.83(c): "compensable value does not include any losses related to secondary economic impacts caused by the discharge or release." Id. at 19772, col. 1.

research programs would have been successful or that unique and useful information would have been obtained.

Finally, Economic Study No. 1 purports to study the loss to consumers of seafood and reflects many of the same problems associated with the study of consumer losses due to alleged petroleum price increases. Given the market complexities and the existence of many alternate seafood resources, it would appear that the focus of the study will be efforts to determine whether consumers perceived some problem with seafood due to the spill. How the Trustees will determine which sectors of the public may have been affected is unclear and the complexity of the inquiry requires far more explanation.

API recognizes that there were resource losses associated with the EVOS and that many of these losses can be objectively quantified. However, the economic studies described in the 1991 Plan suffer from legitimate concerns as to whether the losses are indeed public losses and whether they are capable of being determined using reliable techniques.

COMMENTS ON SPECIFIC STUDIES

General Concerns On All Biological Studies

A lack of data from the prior two years of studies makes it very difficult to determine the need for additional study. General concerns include the problems with comparing pre-spill and post-spill conditions of populations or individuals, because pre-spill information was often unavailable. It is also unclear whether the "control areas" designated indeed represent such areas from a scientific perspective.

Marine Mammals

Study No. 2 -- Killer Whales

The study, in part, compares the presence of whales identified by unique markings which show up in photographs against photographic data bases for the years 1977 to 1990. This study could be worthwhile provided that the current data base is adequate to support comparisions between years. It would appear that the data being collected will not be sufficient to address all of the objectives identified in the study. In addition, the intrusive nature of the observations that are being performed are of substantial concern and are not adequately addressed in the study. Since data from previous years are not available, it is impossible to determine the value of continuing the study for purposes of spill assessment or restoration actions.

Study No. 5 -- Harbor Seals

The principal concern is that the planned aerial surveys are equivalent to the previous aerial studies conducted in 1989 and 1990 and 1984 and 1986. This is important because seals can only be counted during molting and pupping periods. Such periods must be gauged carefully for the data to be comparable from year to year.

Study No. 6 -- Sea Otters

Objective E of Study 6A "to estimate winter 1991 offshore densities of sea otters in oiled and unoiled areas to estimate otter density values at the time of the oil spill in March 1989," does not appear to have a clear purpose other than to estimate how many otters may have been present in the area. Some confirmation of exposure is needed.

Study 6B uses information from rehabilitation centers regarding the mortality of oiled otters and attempts to develop an analytical model capable of estimating rates of exposure of sea otters to oil, degree of oiling, and mortality following the EVOS. API believes that this study will provide little useful information for either damage assessment or restoration efforts, since the lack of available information precludes testing the accuracy of the model or the underlying data.

Study 6C has the advantage of studying individual animals. However, two years of study are adequate to meet the stated objectives and the study description does not provide an adequate rationale for its continuation.

Study 6D is designed to determine whether the food sea otters consume is contaminated and is negatively impacting the otters or if otters have shifted their diet away from contaminated species. API does not believe a third year is needed for this study given the limited purposes.

Study 6E looks at dead otters to see if there are patterns in the age, sex, or absolute numbers of the otters observed. There are a great number of parameters which could be affecting sea otter mortality that may be unrelated to the spill and are not apparently being considered along with the observational data. The baseline data collected in 1974 and 1975 may no longer be useful for this purpose.

Study 6F would examine blood and urine samples taken from otters in the spill area and from those in control areas to determine possible differences. The study also purports to determine growth rates and the presence of any physical abnormalities. This study has been conducted for at least one year and does not need to be continued. Too little is known concerning baseline conditions and normal variability to achieve anything conclusive with the study.

Study 6G, like Study 6B, plans to use the data obtained during the examination of otters at rehabilitation centers as it relates to otter mortality. The study attempts to determine the effects of the spill on otters and the strengths and weaknesses of rehabilitation efforts. The study's focus on restoration is useful, although care should be taken to avoid making this a broad research project that it not specifically useful to rehabilitating otters in PWS.

Terrestrial Mammals

Study No. 3 -- River Otters

There does not appear to be adequate background information on river otter blood analyses to make current comparisons meaningful. The utility of continuing the study, therefore, has not been demonstrated. The principal benefits could be a determination of the dietary habits and food selection of the otters as well as the longer term population trends.

Study No. 4 -- Brown Bears

The observational approach used in this study does not appear to be appropriate for meeting study objectives. The need for an additional year of these observations should be reviewed; no data is presented to support the need for more study of brown bear populations.

Bird Studies

Responses to public comments submitted last year regarding specific bird studies reveal a lack of receptivity by the Trustees in modifying the scope or nature of the studies. Also, the failure to release study data makes it very difficult to prepare comments on this year's studies.

Several studies discuss studying oiled and non-oiled areas. It is not clear whether these "oiled areas" are any of the areas affected by the 1989 spill or are only areas that currently contain oil. API believes that more explanation is needed for these terms especially where oil is clearly no longer present.

API also notes that reports indicate that the 1990 oiled bird study, whereby radio transmitters were attached to bird carcasses, resulted in more birds being found than expected. Similarly, eagle studies would appear to show that all known eagle territories were occupied in 1990. API maintains that such results should be factored into any future studies or data analyses to ensure accurate conclusions.

Study No. 1 -- Beached Bird Survey

As discussed above, API does not believe that such a study is authorized under applicable statutory and regulatory authority. Making bird carcasses available to other institutions is not a recoverable cost.

Study No. 2 -- Census/Seasonal Distribution

Given the number and magnitude of variables with studies of this nature, it is hard to believe that anything definitive will be identified. In the objectives, the investigators indicated they will determine (with a high degree of confidence) the distribution and abundance of waterbirds in PWS. There are obvious questions about the ability of any study to accurately estimate the numbers of any highly mobile species such as birds over a large area such as PWS.

Study No. 3 -- Seabird Colony Survey

The study cites a number of assumptions that will be employed. Although use of assumptions may facilitate estimation of bird populations, absolute numbers of lost birds should not be concluded from such assumptions. The study also does not appear to adequately consider natural variation as affecting the bird populations.

Study No. 4 -- Bald Eagles

The third paragraph of the study indicates that estimates of acute mortality will be improved through an assessment of the number of dead birds found in relation to the number of birds that were killed, but never found. How such a "correction" can be accurately determined is not well supported, if indeed it can even be done. It would appear to be a highly speculative estimate.

Under Objective A it is stated that the goal is to estimate numbers of resident bald eagles such that the estimate is within 10 percent of the actual size 95 percent of the time. This will be extremely difficult given the large area encompassed by PWS.

The second paragraph on page 79 states that approximately equal numbers of bald eagles will be sampled from oiled and non-oiled areas. Considering the mobility of the birds, API questions whether investigators could know whether birds had access to both types of areas. The methods for avoiding such a problem should be stated.

Under "Data Analysis" it is stated that "It will be assumed that no major changes in habitat quality or quantity that may affect the breeding population have occurred since 1982, other than EVOS." It must be assumed that factors other than

major physical changes in the habitat will have occurred in that period of time. These factors could cause changes in the eagle population.

Study No. 11 -- Sea Ducks

The study indicates that birds will be radio-tagged in the "oiled and unoiled" areas of PWS. Again there is a question of whether there are any remaining pathways for exposure, since oil is no longer present at the water surface or in the water column below the surface. The mobility of the birds also could cause problems in making population comparisons in the oiled and unoiled areas.

Fish and Shellfish Studies

Study No. 1 -- Injury to Salmon Spawning Areas in PWS

Since mussels are filter feeders, API questions whether water column hydrocarbon analyses were performed and correlated to mussel tissue analytical results. The results of such comparisons are necessary to evaluate the need for and the proper scope of the 1991 studies, especially to the extent that additional data is planned for collection.

Study No. 4 -- Early Marine Salmon Injury Assessment in PWS

As with other studies, the lack of data collected in prior years severely hampers the ability to evaluate the need of continuing this study. There is no theoretical basis offered for the stomach content analyses and the objectives of this work are unclear. API also questions why hydrocarbon analyses of prey items were not conducted comparing oiled and unoiled areas.

Study No. 11 -- Injury to Herring

This is an extensive study of both eggs and biomass. The Oil Exposure Study (p. 153) is new for 1991 and will measure effects on herring eggs and larvae. There will also be egg incubation experiments to measure sublethal effects.

API questions the need for this study in light of the record number of herring netted over the last two years. The broad scope of the herring studies already conducted should provide Trustees with adequate information to identify any injury to the resource and these studies should not have to be extended into 1991.

Study No. 27 -- Sockeye Salmon Overescapement

API continues to question the need to expend considerable funds to determine whether salmon not harvested because of the decision of the State of Alaska to close

the fishing season after the the EVOS will be a problem in subsequent years. Available evidence, such as the record salmon catches and lack of contamination of the fish, indicate that this resource was not injured significantly. Moreover, the large catches of fish since the EVOS offset the Trustees' concerns with reduced fish size and possible higher mortality due to overabundance. This study should not be continued in 1991.

Study No. 28 -- Salmon Spill Injury Model

This study will use life history modeling to project adult returns to oiled and non-oiled areas. The results of the study will supposedly facilitate an evaluation of fishery restoration strategies that will rebuild injured stocks. API believes that the Trustees have yet to demonstrate a significant injury to these resources, especially in light of the record fish catches. Moreover, although API supports studies that are directed toward facilitating the restoration or rehabilitation of injured resources, the injury must be the result of the EVOS.

Study No. 30 -- Data Base Management

API believes that although some funds should be expended on better organizing the data gathered during the studies, there should be a limit on such projects. Only those projects directly related to determining potential injuries of resources in PWS should be conducted for purposes of damage assessment. API does note that the State of Alaska is contributing funds to cover other uses of the data.

Restoration Studies

As API discussed in its comments on the 1989 and 1990 studies and in the April 12, 1991 comments submitted to the Restoration Planning Work Group, which are attached and incorporated by reference into these comments, the principal means of restoration for PWS is likely to be natural recovery, with perhaps selective measures implemented to foster these natural forces. As such, API continues to believe that the Trustees' focus on finding statistical changes in resources that may not be capable of rehabilitation is inconsistent with the restoration intent of the assessment process.

The Trustees still have not adequately concentrated on need for the restoration and the identification of cost-effective means to accomplish this goal. API maintains that the damage assessment process was not intended to become a surrogate for a land acquisition program, and the purchase of land should continue to be a choice of last resort.

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HOLLIDAY ENVIRONMENTAL SERVICES, INC.

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21 May 1991

Trustee Council
P.O. Box 22755
Juneau, AK 99802

Gentlemen:

RE: NATURAL RESOURCE DAMAGE ASSESSMENT & RESTORATION PLAN-
VALDEZ OIL SPILL

We carefully reviewed the two volume captioned document prepared for 1991. We are appalled by the total lack of reference to findings from the previous two years of the instant investigation.

In many cases, the various investigators refer to "comparative data". However, no data are presented or cited in the references. Additionally, we find no data from the previous two years of study of the Valdez spill have been released. Thus, the Trustees are requesting approval and/or comment on "phantom studies". This we believe in poor science.

We recommend the 1991 studies cited in the instant report be deferred until the public is allowed to receive and review the data from previous Valdez studies.

Very truly yours,

G.H. Holliday, Ph.D., P.E., DEE
President

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8 May 71

Trustee Council
Juneau, AK

Dear Trustee Council

While I realize my comments will be of no use to you in development of future injury assessment and restoration efforts, I still want to pass them on to you.

First - I believe the Trustee Council working with Dept. Agriculture, Dept Interior, National Marine Fisheries Service and the State of Alaska are doing a fantastic job. Living in Georgia I was worried. After reading Volume I, you have put my fears to rest.

Second - I was impressed by your Responses to the Comments in Volume II. "You done good."

You efforts are appreciated.

Sam Becher

Mr. Sam Becher
4387 Roswell Rd.
Augusta, GA 30907

Please keep ... on mailing list

American Petroleum Institute
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Washington, D.C. 20005
202-682-8240

G. William Frick
Vice President and
General Counsel

April 12, 1991

Secretary, Restoration Planning Work Group
Oil Spill Restoration Planning Office
437 E Street, Suite 301
Anchorage, Alaska 99501

Re: Prince William Sound and Gulf of Alaska Draft Restoration Work Plan for 1991, 56 Fed. Reg. 8898 (March 1, 1991)

Dear Trustee Council Members:

The American Petroleum Institute (API) welcomes this opportunity to comment on the Draft 1991 Restoration Work Plan now under consideration. API is a national trade association whose corporate and individual members are engaged in all facets of the petroleum industry. API's members therefore have a direct interest in the appropriateness of restoration plans developed by public trustees for natural resources.

Due to an insufficiency of supporting information, API is handicapped in its ability to meaningfully comment on the reasonableness of this Draft Restoration Plan. Specifically, the Draft Plan lacks documentation of the extent of alleged injuries or the cost-effectiveness of the proposed alternative restoration measures. API urges the Trustees to render such information in its revised Restoration Work Plan and to consider the attached, additional comments of the API on the Draft Plan.

Sincerely,

G. William Frick

Attachment

The American Petroleum Institute ("API") submits the following comments on "Draft 1991 Restoration Work Plan" ("Draft Work Plan") for the Exxon Valdez oil spill, published by the Environmental Protection Agency on behalf of Federal and State Trustees and dated March 1, 1991. API, in its comments filed on the 1989 and 1990 assessment plans, pointed out that those plans fail to: (1) include the results of previous studies and other information vital to understanding and evaluating the proposed activities, and (2) comply with the procedures set forth in the Department of Interior's Natural Resource Damage Assessment Regulations. In addition, API questioned the nature of some of the studies planned as concentrating on "basic" or general research. To a large extent, these same criticisms apply to the Draft 1991 Restoration Work Plan as well.

In the comments which follow, API reviews and comments upon the 1991 restoration planning and implementation activities. In particular, API notes:

- The Draft Work Plan lacks adequate information crucial to understanding and evaluating the proposed restoration activities, thereby frustrating meaningful public comment;

- The restoration planning process proposed in the Draft Work Plan fails to require selection of the cost-effective restoration alternative and limit restoration projects to measures required to restore the injured resources to the conditions which would exist absent a spill.

- Major parts of the proposed restoration projects appear to be directed toward habitats not affected by the spill.

The expenditures associated with the assessment of injury and the quantification of damage to the resources of Prince William Sound are unprecedented. API maintains that this information should be available to the public so that meaningful review and comment on the proposed restoration activities can be made. The restoration activities discussed the Draft Work Plan cannot be justified as either necessary or reasonable given the lack of supporting information. API urges the Trustees to provide adequate information to support its proposed restoration activities and to adopt the restoration planning procedures contained in the DOI regulations to ensure that all restoration activities are both necessary and reasonable.

Discussion of Comments

- The Draft Work Plan lacks adequate information crucial to understanding and evaluating the proposed restoration activities, thereby frustrating meaningful public comment.

Ability to provide meaningful review and comment on the Draft Work Plan is frustrated by the lack of information necessary to properly evaluate the proposed restoration activities. This lack of information also impedes API's ability to suggest alternative restoration activities or measures. Sound technical and scientific information concerning the nature and extent of the injuries to the natural resources impacted by the oil spill must be available if the public is to evaluate and propose restoration activities.

Whether any of the proposed restoration projects qualifies as necessary restoration work depends upon the project being a cost-effective restoration alternative which will restore the injured resource to the condition which would exist absent the spill. Without the proper information, no one can determine whether a proposed project constitutes necessary restoration work. While a project may be desirable from the viewpoint of environmental conservation or protection, the cost of a project can only be chargeable to the potentially responsible party under the NRDA framework if the project constitutes necessary restoration work.

The DOI regulations provide a reasoned and disciplined process for assessing resource injuries and determining necessary restoration work and costs. This process envisions that certain information will be available to evaluate proposed restoration projects. This information includes a complete description of the nature and extent of resource injury, an estimate of the amount of the resource which has been impacted or service level reduction, a valuation of the loss attributable to the injury, a description of alternative restoration measures, including natural recovery, and the costs and time associated with each restoration alternative. Whether the Trustees elect to follow the DOI regulations or not, this information is crucial to determining whether the proposed restoration activities are necessary or reasonable. Without this information, no one can determine whether the proposed restoration work plan is appropriate. API strongly recommends that the revised restoration work plan contain sufficient information, including the results of the prior damage assessment studies so that interested parties can evaluate the appropriateness of the proposed restoration activities.

- The restoration planning process proposed in the Draft Work Plan fails to require selection of the cost-effective restoration alternative and limit restoration projects to measures required to restore the injured resources to the conditions which would exist absent the spill).

As currently written, the Draft Work Plan only requires the cost effectiveness and reasonableness of cost of the restoration project to be considered by the Trustees. API strongly believes, and the DOI regulations clearly state, that selection of the cost-effective restoration alternative must be required. Whether the cost of a restoration project is reasonable should depend upon the results of a cost-benefit analysis which requires evaluation of the benefits associated with the proposed project. By incorporating these requirements in the planning process, the restoration work plan will ensure that only necessary restoration projects are undertaken.

The Draft Work Plan also states that a "key goal" of the restoration planning activities is to "identify life history requirements, limiting factors and environmental processes that are especially sensitive or that may be enhanced." These goals appear to go beyond identifying cost-effective restoration measures which will return the injured resources to conditions which would exist absent a spill. Additionally, the restoration feasibility studies undertaken in 1990 and proposed for 1991 appear to be basic scientific research rather than necessary restoration work. This is especially true since the studies have been or are being undertaken before there is documentation of injury to the resource in question. API urges the Trustees to limit the restoration planning activities to those which are necessary to restore injured resources to conditions which would exist absent a spill.

- Major parts of the proposed restoration projects appear to be directed towards habitats not affected by the spill.

The proposed Protection of Strategic Fish and Wildlife Habitats and Recreation Sites Project appears primarily aimed at protecting resources, (i.e., uplands) which were not impacted by the oil spill. While protection of such resources may in some part aid the recovery of resources injured by the oil spill, API has reservations whether this is the most cost-effective restoration alternative. Similarly, but to a lesser extent, the Salmonid Stocks and Habitat Restoration Project contains elements (i.e., construction of fish ladders and spawning channels) which appear to be designed to modify the preexisting ecosystem rather than address a demonstrable injury.

As stated earlier, API believes that restoration work should be limited to projects which are necessary to restore the injured

resources to conditions which would exist absent a spill. This requires consideration of natural recovery as a restoration alternative and its selection if it is the most cost-effective alternative. In light of the rapid recovery which has already occurred in Prince William Sound, API urges that the revised restoration work plan rigorously evaluate all proposed restoration activities to ensure that they are both necessary and reasonable.

Specific Comments on the Proposed Restoration Projects.

There is inadequate information to determine whether the proposed 1991 restoration projects constitute necessary restoration work. The Draft Work Plan does not describe the nature and extent of the injury to the resources or give any justification as to why the proposed restoration activity is the preferred alternative. In addition to correcting the major deficiencies noted in the above comments, the revised work plan should also address the following specific comments:

- o Restoration of the Beach Wild Rye Community.

The areas of the injured Rye Grass communities should be identified, and a discussion of the results expected from natural recovery and transplanting/fertilizing should be provided.

- o Public Information and Education Project.

Allegedly, the stated purpose of this project is to allow injured resources to recover more rapidly by minimizing harmful human disturbances. Assuming that this constitutes a cost-effective restoration alternative, the project should be limited to distributing information on how to avoid disturbing the injured resources.

- o Salmonid Stocks and Habitat Restoration.

It appears that this project includes the activities which go beyond restoring the injured resource to the condition which would exist absent the spill. Specifically, the construction of spawning channels and fish ladders to overcome physical hydrological barriers appears to be directed toward improving the quality of streams beyond their pre-spill level. API also questions whether these activities are consistent with the wilderness character of the area. Most importantly, API questions the need for any salmon restoration project given the lack of documented injury to the resource.

- o Protection of Strategic Fish and Wildlife Habitats and Recreation Sites.

The project appears to be focused primarily on protecting resources (e.g., uplands) that were not impacted by the oil spill. This is

evidenced by the fact that the project's scope appears not to be limited to the Oil Spill area. API would also point out that acquisition of land for federal management should only be considered if it is the sole viable restoration alternative. API urges the Trustees to implement all other viable restoration alternatives, including natural recovery, in lieu of this project and to use all possible means that exist under federal and state statutes and regulations to protect these habitats and recreational sites. Specifically, the Trustees should consider enforcing Alaska law [AS 41.17.010 - AS 41.17.950] to prevent harvesting of timber in those areas where protection is required.

The trustees have stated they will provide further opportunity for public comment on the 1991 restoration plan (see 56 Fed. Reg. 8902). API reserves the right to review and comment further on the draft 1991 Restoration Work Plan when additional information is made available to the public.