F1000

Attachment H

COVER SHEET (PAGE 1 of 2)

May 1998 CALFED ECOSYSTEM RESTORATION PROPOSAL SOLICITATION

Proposal Title: Life History Experiment of Delta Smelt Habitat Use

Applicant Name: Hanson Environmental, Inc.

Mailing Address: 132 Cottage Lane, Walnut Creek, CA 94595

Telephone: (925) 937-4606

Fax: (925) 947-4608

Amount of funding requested: $ 91,410.00 for 1 years

Indicate the Topic for which you are applying (check only one box). Note that this is an important decision: see page __ of the Proposal Solicitation Package for more information.

- ☐ Fish Passage Assessment
- ☐ Fish Passage Improvements
- ☐ Floodplain and Habitat Restoration
- ☐ Gravel Restoration
- ☐ Fish Harvest
- ☒ Species Life History Studies
- ☐ Watershed Planning/Implementation
- ☐ Education
- ☐ Fish Screen Evaluations - Alternatives and Biological Priorities

Indicate the geographic area of your proposal (check only one box):

- ☐ Sacramento River Mainstem
- ☐ Sacramento Tributary: _____
- ☒ Delta
- ☐ East Side Delta Tributary: _____
- ☐ Suisun Marsh and Bay
- ☐ San Joaquin Tributary: _____
- ☐ San Joaquin River Mainstem
- ☐ Other: _____
- ☐ Landscape (entire Bay-Delta watershed)
- ☐ North Bay: _____

Indicate the primary species which the proposal addresses (check no more than two boxes):

- ☐ San Joaquin and East-side Delta tributaries fall-run chinook salmon
- ☐ Winter-run chinook salmon
- ☐ Spring-run chinook salmon
- ☐ Late-fall run chinook salmon
- ☐ Fall-run chinook salmon
- ☒ Delta smelt
- ☐ Longfin smelt
- ☐ Splittail
- ☐ Steelhead trout
- ☐ Green sturgeon
- ☐ Striped bass
- ☐ Migratory birds

COVER SHEET (PAGE 2 of 2)

May 1998 CALFED ECOSYSTEM RESTORATION PROPOSAL SOLICITATION

Indicate the type of applicant (check only one box):

☐	State agency	☐	Federal agency
☐	Public/Non-profit joint venture	☐	Non-profit
☐	Local government/district	☒	Private party
☐	University	☐	Other: _____

Indicate the type of project (check only one box):

☐	Planning	☐	Implementation
☐	Monitoring	☐	Education
☒	Research		

By signing below, the applicant declares the following:

(1) the truthfulness of all representations in their proposal;

(2) the individual signing the form is entitled to submit the application on behalf of the applicant (if applicant is an entity or organization); and

(3) the person submitting the application has read and understood the conflict of interest and confidentiality discussion in the PSP (Section II.K) and waives any and all rights to privacy and confidentiality of the proposal on behalf of the applicant, to the extent as provided in the Section.

(Signature of Applicant)

Executive Summary

Project Title: Life History Experiment of Delta Smelt in the Sacramento-San Joaquin Bay-Delta

Applicant Name: Hanson Environmental, Inc. in association with Jones and Stokes Associates (JSA).

Project Description/Objectives: Hanson Environmental and JSA propose to conduct an experiment that addresses testing of important life history and habitat use hypotheses for delta smelt in the Bay-Delta. The experiment will entail sampling for subadult and adult delta smelt at two locations in the Delta across a sharp gradient of micro-habitat conditions (e.g., depth, presence of vegetation, and substrate) over a short period of time. The objective of the experiment will be to test hypotheses relative to macro-and micro-habitat use and preferences of delta smelt.

Approach/Tasks/Schedule: Hypotheses as to habitat use and preference of delta smelt derived from existing information will be tested in a field experiment with a tailored experimental design, and rigorous statistical analysis of the experimental data. The basic approach will involve four major tasks: (1) develop testable hypotheses and an experimental design; (2) conduct a field experiment designed to address hypotheses; (3) process samples and sampling data; (4) analyze data; and (5) prepare a report on findings, seek peer review, and publish findings. Tasks 1 will be conducted during the first three months of the project. Task 2 would take place over a one-month period in the fall or winter quarter toward the end of the first three months of the project. Tasks 3 and 4 will be accomplished from month 3 through month 6 of the project. Task 5 will occur from month 6 through month 12.

Justification for Project and Funding by CALFED: Though past surveys have provided considerable information on macro-habitat use of delta smelt in the Bay-Delta, there is little or no information on their micro-habitat use. Factors that may affect macro-habitat selection include season, salinity, and regional and seasonal water temperature patterns. Factors that may influence micro-habitat selection include localized and diel water temperature patterns, localized salinity patterns and water quality, depth, current velocity, bottom configuration, cover, available shoreline, food supply, and presence of predators and competitors. Information and knowledge of micro-habitat use and preference is essential for restoring delta smelt habitat and recovery of delta smelt populations. Information obtained could be used to prescribe water project operations that protect and enhance good habitat conditions, and to prescribe habitat alterations that will add to the amount of beneficial habitats available to delta smelt. Such information is essential for guiding planned habitat restoration goals and objectives of CALFED and present and future habitat restoration projects in the Bay-Delta. Though the study would focus on delta smelt, habitat information would also be obtained for other species collected during the study including Chinook salmon, steelhead, splittail, longfin smelt, green and white sturgeon, and striped bass. Valuable information will also be obtained on fish use of special status habitats including many types of wetland, riparian, and aquatic habitats found in the Bay-Delta.

CALFED funding is requested because of the multiple ecosystem objectives of the project, CALFED's willingness to fund life history studies and experiments, and because the project fits the objectives outlined in the ERPP for the Bay-Delta Ecological Zone.

Budget/Cost: The estimated cost of the delta smelt micro-habitat preference study is $91,410.00.

Third Party Impacts: Sampling conducted as part of the experiment would likely cause mortality of small numbers of delta smelt, longfin smelt, Chinook salmon, and other Bay-Delta fishes. Incidental take permits would be necessary to conduct the proposed experiment.

Applicant's and Partners Qualifications: Hanson Environmental and Jones and Stokes Associates, and their proposed principal investigators have extensive experience over the past three decades in studying and evaluating fish habitat use in the Bay-Delta. Each has been integrally involved in the past several years in the CALFED Bay-Delta Program planning efforts. Dr. Hanson is presently a principal investigator on the VAMP Program and has been instrumental in developing gear and protocols for sampling delta smelt in the Bay-Delta. Mr. Shaul has conducted numerous evaluations and assessments of effects of habitat changes on delta smelt in the Bay-Delta, has developed models of macro-habitat use, and conducted many field surveys of Delta habitats. Mr. Cannon has conducted fish habitat surveys and evaluations in many portions of the Bay and Delta, and has specialized in experimental design and analysis of fish habitat use and selection studies in estuaries and large rivers throughout North America including the Bay-Delta. All have worked together in recent years, including participation in various technical workshops including the Delta Smelt Workshops. Dr. Hanson's and Mr. Cannon's professional collaborations date back to the 1970's and include working together on fish habitat surveys in Suisun Bay and the western Delta in 1978/79 and the State Board's Striped Bass Committee in the early 1980's. Together the principal investigators and their affiliated organizations bring together a unique combination of resources and capabilities to accomplish the goals and objectives of the project as well as those of CALFED.

Monitoring and Data Evaluation: Monitoring and data evaluation are essential elements of the proposed project.

Local Support/Coordination with Other Programs/Compatibility with CALFED Objectives: Hanson Environmental and JSA have for years worked together to protect and enhance ecosystem and non-ecosystem values of the Bay-Delta. Project efforts will be closely coordinated with IEP Program studies and surveys, as well as those of the US Fish and Wildlife Service's Anadromous Fish Restoration Program and new habitat restoration projects being conducted by CALFED agencies and the Category III and Ecosystem Restoration Program.

Life History Experiment of Delta Smelt Habitat Use
in the Sacramento-San Joaquin Bay-Delta

Applicant:

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Type of organization: Private Corporation
Tax identification number: 68-0249668

Principal Investigators:
Charles Hanson, Ph.D. - Hanson Environmental, Inc.
Warren Shaul - Jones & Stokes Associates
Thomas Cannon - Jones & Stokes Associates

1. Project Description

a. Project Description and Approach

We propose to conduct an experiment to assess habitat selection of delta smelt in their natural setting of the Delta. The experiment would involve sampling delta smelt in the sub-adult and adult phase across a narrow gradient of habitat conditions over a short time to determine habitat selection based on abundance within certain ranges of habitat conditions. The experiment would be replicated by sampling two locations of known delta smelt concentrations.

Locations. We propose to replicate the experiment at two locations: (1) A shoal near Gallagher Island off the south east shore of Sherman Island. This is a known concentration for delta smelt with extensive sampling from other surveys conducted by IEP and VAMP programs. A Category III channel island restoration project is also planned at this location. The location offers a diversity of habitat from which to measure delta smelt abundance. (2) A shoal near Montezuma Island near Collinsville at the eastern end of Suisun Bay and at the mouth of the Sacramento River at the west end of the Delta. This site is another known concentration of delta smelt that has been extensively sampled in other studies over the years; the site also has a diversity of habitat conditions in a relatively localized area. We have conducted detailed surveys at this location in 1978/79 for PG&E and are familiar with the area. Alternative sites that may be considered are Sherman Lake, Pittsburg, Decker Island, and Honkers Bay.

Gear. We propose two gear types to sample delta smelt, both of which have proven successful on small pelagic fish including subadult and adult delta smelt. An adjustable depth Kodiak trawl will sample all but the shallowest inshore waters. A small purse seine (approximately 50 meters by 2 meters) would sample shallow inshore waters. Samples collected with each gear would all be collected in the same manner (i.e., duration, distance, area deployed). For prey sampling, we propose a drop net or pump sampler in combination with a plankton net.

Season: Sampling is proposed for one season, one time, in either late summer, fall, or winter when delta smelt are relatively abundant in the western Delta or eastern Suisun Bay and in the subadult or adult life stage. Results of IEP/DFG sampling will be used to schedule the final locations and seasonal timing for conducting this investigation.

Sampling Design. Sampling gear would be deployed to sample single discrete locations across a range of shallow water (<3m in depth) habitats at the survey location. Samples would be taken across the whole range of depths including deeper water (2-3 m) and in shallowest water (<1 m). Sampling in deeper water (>3 m) adjacent to each location will also be conducted as part of the comparisons. As many samples as possible would be taken across a gradient of habitats over a 24 period and nearly two full tidal cycles. Samples would be taken sufficiently far apart as to ensure that one sample does not disturb the collection of another. An effort will be made to distribute sampling across as wide a range of habitat conditions as possible to account for as much variability in delta smelt distribution as possible. Ancillary data will be collected at the time of primary net sampling including water temperature, salinity, turbidity, depth, etc. A plankton net (either drop net or pumped net) would be sampled with each trawl or seine haul to

provide an indication of food available to delta smelt. Supplemental surveys will be made during sampling to map the distribution of important habitat variables (e.g., depth, distance from emergent vegetation, salinity, water temperature) to provide information on habitat availability.

Dependent Variables. The dependent variable will be catch density (number per m^3) of delta smelt collected in each sample. Other species numbers collected may also be treated as dependent variables if sufficient numbers are obtained, although the intent is to concentrate on delta smelt.

Independent Variables. Independent variables will include any feature or parameter measured with each sample that may have a bearing on delta smelt presence or catch. Key variables are those we will attempt to vary to a certain extent through the distribution of sampling: these include depth, time of day, tide, substrate, presence of vegetation, slope, proximity to shoreline, etc. Ancillary variables will be those we cannot control that could vary considerably: turbidity, prey abundance, wave action, etc. Other variables that may be controlled include salinity and water temperature. Note that many so called "independent" variables are truly not independent from one another (e.g., water temperature and salinity are often related in an estuary).

Analytical Approach. The proposed analytical approach is a regression approach rather than a controlled treatment analysis, because most of the variables that may influence delta smelt catch cannot be controlled as in a "controlled" experiment. Dependent variables will be plotted against single independent variables to show associations and the form of associations (e.g., linear, log, non-linear, etc.). Multivariate analysis in the form of Principal Components Analysis (PCA) will be conducted to identify independent features in the set of possibly non-independent "independent" variables. These independent features are principal components. The first component is the feature that accounts for the greatest amount of variance in the total data set. Depth would likely be one of the variables accounting for variance in delta smelt catch in the first principal component. Habitat utilization curves will be prepared. Utilization will be compared with availability as determined from supplemental survey sampling of the local pattern of independent variables in the sampling area.

b. Proposed Scope of Work

i. Incremental Project Phases

The proposed project is a single phase of a complete experiment on delta smelt. The single season, single life stage experiment proposed is designed to show the utility of the method - particularly how much information about habitat selection can be gained in a very short period of sampling with a relatively small set of samples. Future experiments may seek answers to habitat selection in other locations, for different life stages of delta smelt, and under different environmental circumstance (e.g., wet or dry year conditions). Results will support development of design criteria for delta smelt habitat and future performance evaluations/hypothesis testing.

ii. Tasks

Task 1. The initial task will be to set up the experiment. The experimental design, sampling

protocol, gear selection, sampling locations, sampling date, and sampling logistics will be developed. The sampling design would be discussed with the IEP Resident Fish Team. An incidental take permit would be obtained from FWS. We assume a short BA will be necessary as part of permit application. If permit is not granted, then no further tasks would be undertaken. **Schedule:** fall or winter quarter. **Deliverables:** experimental design and sampling protocol.

Task 2a. Fish sampling with trawls and seines will be conducted. Supplementary sampling of habitat conditions to map habitat conditions throughout the survey area will be conducted in addition to primary net sampling for delta smelt **Schedule:** One month in the fall or winter quarters. **Deliverables:** Sample data collected in data sheets and electronic format. A data report documenting sampling will be prepared.

Task 2b. Invertebrate sampling with drop nets or pump sample will occur in association with fish sampling. **Schedule:** same as fish sampling. **Deliverables:** Sample data in data sheet and electronic format. A data report documenting sampling will be prepared.

Task 3. Sample processing will be conducted as necessary. Plankton net samples will be the primary processing required. **Schedule:** Within one month of sample collection. **Deliverables:** Sample data sheets and electronic format. Data will be included in data report.

Task 4. Data analysis will be conducted. Data will be plotted. Correlation and PCA analysis will be conducted. Map distributions of habitat conditions in the survey area will be prepared. A qualitative assessment of habitat preference will be made by comparing utilization data with availability data. **Schedule:** within one month of completion of sample processing. **Deliverables:** Plots and analysis table summaries in project report.

Task 5. A project report/paper will be prepared in draft and final. Report will include abstract, introduction, methods, results, and discussion in a format suitable for submittal to a peer reviewed journal. Report will address delta smelt and other species utilization curves and relate these to habitat available in the survey area. Paper will be submitted for peer review. A presentation would be made to the IEP Resident Fish Team on the results of the project. **Schedule:** within six months of completion of sample processing. **Deliverables:** draft report/paper; peer review; and final report/paper.

Inseparable Tasks. All tasks are necessary to complete the experiment. Prey abundance could be dropped as an independent variable from this pilot experiment, which would eliminate the need for tasks 2b and 3.

c. Location and/or Geographic Boundaries of the Project

The Gallagher Island site and the Montezuma Island site are in the western Delta (Figure 1).

d. Expected Benefits

The experiment is designed to provide valuable insights into micro-habitat fish sampling and

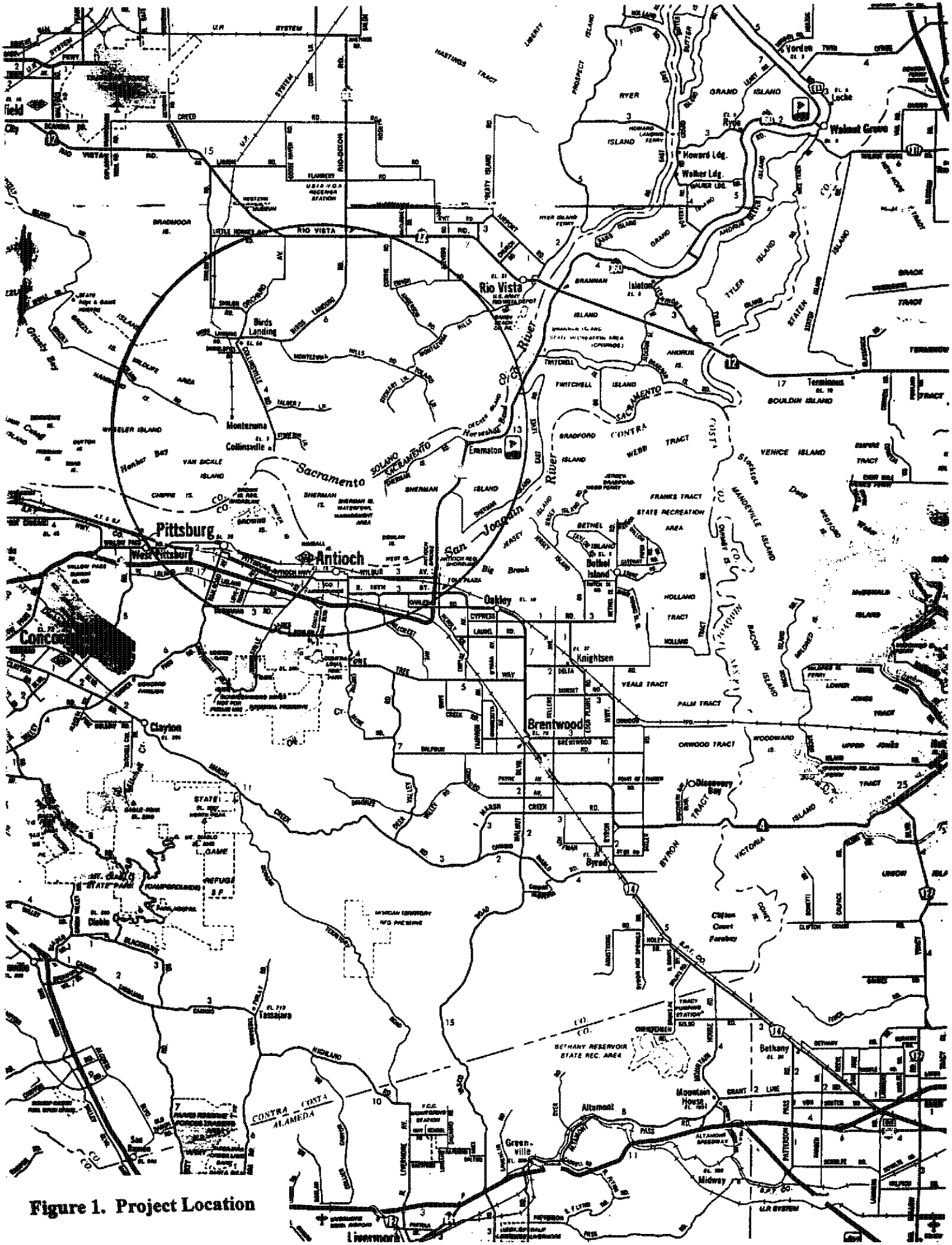

Figure 1. Project Location

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data analysis for the Bay/Delta. The experiment, if successful in capturing sufficient numbers of delta smelt, will provide valuable data on the life history and habitat utilization and preferences of delta smelt in the Bay/Delta. Such information could be used to define critical habitat, supplement existing information on macro-habitat use, and provide new information on micro-habitat use, which in turn could be used to help design habitat restoration projects that would benefit delta smelt. Such information would also be valuable in assessing risks and impacts on delta smelt from activities occurring in the Bay/Delta. Similar benefits may also be achieved for species other than delta smelt if sufficient data are collected. The utility of such experiments may be the greatest benefit provided, if such experiments are shown to cost effectively provide needed information on the life history and habitat preferences of important Bay/Delta species. Information may also be valuable to the delta smelt recovery plan by identifying critical habitat and habitat conditions preferred by delta smelt. Finally, information obtained may provide valuable clues into the cause of population variability of the delta smelt.

e. Background and Ecological/Biological/Technical Justification

Delta smelt are a native resident fish of the Delta that has undergone widely varying population levels and sharp declines over the past decade and a half. The Bay-Delta population has been listed as threatened under the Endangered Species Act. Seven factors have been listed as potential causes of declines in the population including four habitat related factors: reduction in outflows, high outflows, changes in food organisms, and predation and competition. Each of these factors would be addressed in some way in this experiment. Modification of Delta habitats is mentioned in the Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes (FWS 1995) as "the single biggest reason for listing because of changes in Delta outflow. A decrease in fresh and brackish flooded marshes in recent decades is another related factor that may have also contributed to the decline. The conservation strategy prescribed in the Recovery Plan is for greater freshwater outflow. Critical habitat identified in the Recovery Plan includes all areas of the Delta and Suisun Bay and Marsh that are shallower than 4 m.

The Interagency Ecological Program (IEP) initiated a delta smelt study in 1992 to investigate all aspects of delta smelt biology to improve understanding of the causes of the population decline and ensure better informed water management decisions. Objectives include providing the best available scientific information and increased understanding of the delta smelt's environmental requirements. Projects include surveys of adult delta smelt distribution and determination of preferred habitats of older juvenile delta smelt. Priorities identified in recent delta smelt workshops include habitat studies to identify utilization of shallow water habitats, and identify spawning and rearing habitat. IEP staff note that small-scale micro-habitat features used by delta smelt have yet to be determined.

Other IEP surveys and two recently initiated studies may provide more light on habitat use. IEP's inland silverside predation study may provide additional insights on inshore habitat use and the role of silverside predation. The Category III "Flooded Island" project has components that will provide valuable information on habitat use in newly flooded islands, although sampling will focus on only two shallow water types: open water and edge of emergent vegetation, and

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only on neap tides. IEP has also conducted some short term Tucker trawling and purse seining for delta smelt.

While these surveys focus on life history of delta smelt, they do not provide the comprehensive fine scale, micro-habitat use and availability comparison offered by our proposed experiment that is designed specifically for this purpose. The Flooded Island Project will address fish use of micro-habitats but in a different experimental design from our proposed project. We believe our experiment will compliment these studies and provide a more quantitative expression of delta smelt habitat use and preference that is compared to habitat available. Our study also focuses on two areas in the open Delta not specifically flooded islands as in the Flooded Island Project. These "open" areas of the Delta have traditionally been within the heart of population distribution of delta smelt.

The experimental design and analytical approach also offer some distinct advantages over those of the above described surveys. Sampling over a short time period and in a relatively small area across a sharp gradient of habitat conditions can provide strong insight into habitat use. If habitat use is tied to availability of habitat types, then insights into habitat preference can also be gained. Tom Cannon effectively used these same techniques in describing habitat use of juvenile fishes and invertebrates in a coastal, river-delta estuary in Alaska. He and his associates were able to portray habitat use of a community of resident and anadromous fishes and their macroinvertebrate prey from data collected from several hundred purse seine hauls and drop nets collected over a one-month period (Cannon et al. 1991a, 1991b; Hachmeister et al. 1991). The principal components analysis in particular was able to depict important habitat relationships from secondary features in the data that would normally not be readily apparent in standard univariate or multivariate plotting of the data or from correlation analysis. Such secondary features (often the second or third ranking principal components) can be important determinants in fish habitat use and preference. These features in the data often go unnoticed because of the high intercorrelation among the "independent" habitat variables measured in an uncontrolled field experiment.

i. ERPP objectives met

ii. AFRP/CVPIA Objectives met

iii. Nature and basis for durability of benefits

While the experiment will provide habitat use insights for a narrow range of conditions and localized area of the Delta, the habitat use patterns observed for delta smelt and other species should be of general use and allow testing of long-standing hypotheses of delta smelt habitat use and preferences. It is likely that habitat use and preference will vary, between life stages, with location, and with changes in local habitat conditions (i.e., water temperature and salinity); but it is also likely that the basic response of delta smelt to specific habitat gradients and multiply varying habitat factors could reflect a stable response pattern for the species.

iv. Current status

As stated earlier, IEP continues its Delta Smelt Study and other special studies including the new Category III Flooded Island Study. Our proposed experiment should complement these efforts and provide new information and new techniques for determining delta smelt habitat

requirements and insights into potential causes of the population decline over the past two decades.

f. Monitoring and Data Evaluation

Our experiment is designed to compliment data collected in other IEP surveys including the Real-time Monitoring Program, the 20-mm Survey, the Fall Midwater Trawl Survey, and the VAMP surveys. Both targeted sampling areas are near sampling stations of all of these programs. Delta smelt micro-habitat distribution patterns obtained from our experiment can be tied to the macro-scale patterns from these surveys. These surveys will also point out where and when delta smelt may be occurring at our primary and secondary sampling sites, which will help maximize our ability to capture delta smelt in the experiment. Local distribution patterns observed in this experiment will be compared and integrated with the macro-scale, regional patterns observed in the IEP surveys.

g. Use of Peer Review

We propose to involve the Resident Fish Project Work Team of IEP in the experiment from the initial experimental design through the final report preparation. Chuck Hanson would report on the experiment in monthly meetings and solicit active involvement in the experiment from other Team members. Experiment results will also be submitted to the IEP newsletter, DFG's Fish and Game Journal, or possibly a national fish or ecology journal. Results would be offered for presentation at the annual IEP meeting and the annual meeting of the California section of the American Fisheries Society.

h. Quality Assurance and Standard Methods

All field sampling, sample processing, and data management will be conducted by Hanson Environmental under standard sampling and quality assurance protocols of the VAMP surveys.

i. Database Considerations

All sampling data will be presented to IEP in standard database formats.

j. Implementability

An essential prerequisite of the experiment will be incidental take permits for sampling in waters with winter run Chinook salmon and delta smelt. Our experiment will specifically target delta smelt and attempt to observe and document the hypothesis that they are more abundant in shallower water. We hope to convince NMFS and FWS that take in the experiment will be minimal and essential to learning more about the species habitat requirements. It may be that we will have to confine our sampling to seining so as to release a greater proportion of our catch undamaged. Otherwise we see little to hinder implementing the experiment, other than the possible exception of lack of available delta smelt, which we do not believe will be a problem given improved population levels in recent years and the many surveys ongoing in the area to point out times and locations where delta smelt can be found in abundance.

2. Cost and Schedule to Implement Proposed Project

a. Budget Costs

The budget costs for the experiment are $91,410.00. Costs include labor and materials necessary to complete the project and provide deliverables. Budget costs are summarized below:

i. Table

Phase and Task	Direct Labor Hours	Direct Salary and Benefits	Overhead Labor (G&A, fee)	Service contracts	material and acquisition contracts	Misc. and other direct costs	Total Cost
Task 1	126	6240	3662	2000		100	12128
Task 2a	332	6900	6676	1000	1500	2440	18848
Task 2b	80	1500	1540			610	3730
Task 3	424	7080	8616			100	16220
Task 4	80	3600	2520	15000			21200
Task 5	180	6780	5024	7000		300	19284
	1222	32100	28038	25000	1500	3550	91410

a. Schedule and Milestones

The experiment could be undertaken as early as winter 1999. Planning and logistics would be accomplished in the first quarter. Sampling would occur during the second quarter. The remaining tasks would be completed in the third and fourth quarters. Sampling would take approximately one month with sampling conducted approximately for two weeks at each of the two sites. The payment schedule would be by task upon completion of each task.

b. Third Party Impacts

Sampling conducted as part of the experiment would likely cause mortality of small numbers of delta smelt, longfin smelt, Chinook salmon, and other Bay-Delta fishes. Approximately 200 net samples are expected to be taken in the study, with the majority being taken with seines, which should limit losses. Kodiak trawling would have only 5 minute duration tows to limits losses. Incidental take permits would be necessary to conduct the proposed experiment.

3. Qualifications

Hanson Environmental and Jones and Stokes Associates, and their proposed principal investigators have extensive experience over the past three decades in studying and evaluating fish habitat use in the Bay-Delta. Each has been integrally involved in the past several years in the CALFED Bay-Delta Program planning efforts. Dr. Hanson is presently a principal investigator on the VAMP Program and has been instrumental in developing gear and protocols for sampling delta smelt in the Bay-Delta. Mr. Shaul has conducted numerous evaluations and assessments of effects of habitat changes on delta smelt in the Bay-Delta, has developed models of macro-habitat use, and conducted many field surveys of Delta habitats. Mr. Cannon has conducted fish habitat surveys and evaluations in many portions of the Bay and Delta, and has specialized in experimental design and analysis of fish habitat use and selection studies in estuaries and large rivers throughout North America including the Bay-Delta. All have worked together in recent years, including participation in, IEP Project Work Teams, IEP annual meetings at Asilimar, and various technical workshops including the Delta Smelt Workshops. Dr. Hanson's and Mr. Cannon's professional collaborations date back to the 1970's and include working together on fish habitat surveys in Suisun Bay and the western Delta in 1978/79 and the State Board's Striped Bass Committee in the early 1980's.

The principal investigators and their companies bring together a unique combination of resources and capabilities to accomplish the goals and objectives of the project as well as those of CALFED. Hanson Environmental has extensive experience in conducting fisheries surveys in the Bay/Delta and Central Valley rivers. They have the necessary technical field and laboratory staff and equipment to fully undertake the proposed work. Together Hanson Environmental and Jones and Stokes Associates have the necessary data analysis and reporting capabilities to meet the proposed project needs.

Charles H. Hanson. Dr. Hanson has a Bachelors and Masters Degree in Fisheries Biology from the University of Washington, College of Fisheries and a Ph.D. in Fisheries and Ecology from the University of California at Davis. Dr. Hanson has been actively involved in fisheries research projects within the Sacramento-San Joaquin Delta since 1976. Dr. Hanson has designed and conducted a number of fisheries investigations within the Delta including major studies of the impact of cooling water system operations at the PG&E Contra Costa and Pittsburg power plants (entrainment, impingement, and thermal effects), the evaluation of diversion losses and alternative methods of fish protection, Delta smelt geographic distribution and abundance surveys, shallow-water habitat use investigations, Chinook salmon survival studies associated with the Vernalis Adaptive Management Plan (VAMP), and a variety of other investigations. Dr. Hanson served on the State Water Resources Control Board striped bass technical work group and also served as a member of the U.S. Fish and Wildlife Service team to draft the "Recovery Plan for the Sacramento/San Joaquin Delta Native Fishes". Dr. Hanson and the staff of Hanson Environmental have worked closely with representatives of the California Department of Fish and Game, U. S. Fish and Wildlife Service, Department of Water Resources, Bureau of Reclamation, and a variety of other agencies to collect scientific information on characteristics of

aquatic habitats preferentially utilized by resident and anadromous fish, and the dynamics of fisheries populations within the Delta. Many of these studies have been designed to provide the technical foundation for establishing and evaluating design criteria for habitat improvement projects. Dr. Hanson has also authored a multi-species Habitat Conservation Plan for an area on the Sacramento River in the vicinity of Grimes, and has participated in numerous State Water Resources Control Board water right and water quality hearings.

Thomas C. Cannon. Mr. Cannon has a bachelors degree in fishery science from the University of Michigan, a masters degree in biology from Northern Michigan University, and a masters degree in biostatistics from the University of Michigan. Since completing his masters thesis on salmonid fish habitat use he has spent over 20 years studying fish habitat use in estuaries and rivers of North America. He spent five years surveying the distribution and abundance patterns of estuarine fishes in the Hudson River estuary in New York; two years reviewing estuary fish and invertebrate data on the Columbia River estuary, five years on Alaskan estuaries, and nearly 10 years involved in the study of the Sacramento-San Joaquin estuary dating back to 1997. He was a member of the Striped Bass Committee which reviewed the status of striped bass in the Bay/Delta for the State Water Resources Control Board in 1981-82. He managed studies of shallow water fish distribution and abundance at Pittsburg, Antioch, and Collinsville sites for PG&E in 1978/79. He designed and managed estuary wide larval and juvenile fish surveys in 1978/79 for PG&E. He has spent nearly 4 years reviewing fish distribution data from the Bay/Delta for the State Water Contractors and Metropolitan Water District. He was a consultant to the National Marine Fisheries Service in 1980-1982 and evaluated the importance of the Sacramento-San Joaquin Estuary as a nursery area to anadromous fish. More recently he provided technical support relating to fish habitat use in the Bay/Delta and Central Valley rivers to CALFED in the development of the CALFED ERPP (1995-97), PG&E's HCP for the Delta Power Plants, and the Delta Wetlands Project.

4. Compliance with standard terms and Conditions

Hanson Environmental, Inc. does not request any deviations or exemptions from the standard terms and conditions as outlined in the Proposal Solicitation Package (May 1998). Hanson Environmental, although operating as a small business, has not completed the necessary certification to qualify for small business credits. The requested Nondiscrimination and Noncollusion forms are attached.

I-010457

Agreement No. _____

Exhibit _____

STANDARD CLAUSES— SERVICE & CONSULTANT SERVICE CONTRACTS FOR $5,000 & OVER WITH NONPUBLIC ENTITIES

Workers' Compensation Clause. Contractor affirms that it is aware of the provisions of Section 3700 of the California Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self insurance in accordance with the provisions of that Code, and Contractor affirms that it will comply with such provisions before commencing the performance of the work under this contract.

Claims Dispute Clause. Any claim that Contractor may have regarding the performance of this agreement including, but not limited to, claims for additional compensation or extension of time, shall be submitted to the Director, Department of Water Resources, within thirty days of its accrual. State and Contractor shall then attempt to negotiate a resolution of such claim and process an amendment to this agreement to implement the terms of any such resolution.

National Labor Relations Board Clause. In accordance with Public Contract Code Section 10296, Contractor declares under penalty of perjury that no more than one final, unappealable finding of contempt of court by a federal court has been issued against the Contractor within the immediately preceding two-year period because of Contractor's failure to comply with an order of a federal court which orders Contractor to comply with an order of the National Labor Relations Board.

Nondiscrimination Clause. During the performance of this contract, the recipient, contractor and its subcontractors shall not deny the contract's benefits to any person on the basis of religion, color, ethnic group identification, sex, age, physical or mental disability, nor shall they discriminate unlawfully against any employee or applicant for employment because of race, religion, color, national origin, ancestry, physical handicap, mental disability, medical condition, marital status, age (over 40), or sex. Contractor shall insure that the evaluation and treatment of employees and applicants for employment are free of such discrimination. Contractor shall comply with the provisions of the Fair Employment and Housing Act (Government Code Section 12900 et seq.), the regulations promulgated thereunder (California Administrative Code, Title 2, Sections 7285.0 et seq.), the provisions of Article 9.5, Chapter 1, Part 1, Division 3, Title 2 of the Government Code (Government Code Sections 11135 - 11139.5), and the regulations or standards adopted by the awarding State agency to implement such article. Contractor or recipient shall permit access by representatives of the Department of Fair Employment and Housing and the Awarding State agency upon reasonable notice at any time during the normal business hours, but in no case less than 24 hours notice, to such of its books, records, accounts, other sources of information and its facilities as said Department or Agency shall require to ascertain compliance with this clause. Recipient, contractor and its subcontractors shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement. The Contractor shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under the contract.

Statement of Compliance. The contractor's signature affixed hereon and dated shall constitute a certification under penalty of perjury under the laws of the State of California that the Contractor has, unless exempted, complied with the nondiscrimination program requirements of Government Code Section 12990 and Title 2, California Code of Regulations, Section 8103.

Performance Evaluation. Contractor's performance under this contract will be evaluated after completion. The evaluation will be filed with the Department of General Services.

Availability of Funds. Work to be performed under this contract is subject to availability of funds through the State's normal budget process.

Audit Clause. The contracting parties shall be subject to the examination and audit of the Auditor General for a period of three years after final payment under the contract. (Government Code Section 10532).

Reimbursement Clause. If applicable, travel and per diem expenses to be reimbursed under this contract shall be at the same rates the State provides for unrepresented employees in accordance with the provisions of Title 2, Chapter 3, of the California Code of Regulations. Contractor's designated headquarters for the purpose of computing such expenses shall be: 132 Cottage Lane, Walnut Creek, CA 94595.

Drug-Free Workplace Certification. By signing this contract, the contractor or grantee hereby certifies under penalty of perjury under the laws of the State of California that the contractor or grantee will comply with the requirements of the Drug-Free Workplace Act of 1990 (Government Code Section 8350 et seq.) and will provide a drug free workplace by taking the following actions:

1. Publish a statement notifying employees that unlawful manufacture, distribution, dispensation, possession, or use of a controlled substance is prohibited and specifying actions to be taken against employees for violations, as required by Government Code Section 8355(a).

2. Establish a Drug-Free Awareness Program as required by Government Code Section 8355(b), to inform employees of all of the following:

   (a) The dangers of drug abuse in the workplace,
   (b) The person's or organization's policy of maintaining a drug-free workplace,
   (c) Any available counseling, rehabilitation and employee assistance programs, and
   (d) Penalties that may be imposed upon employees for drug abuse violations.

3. Provide, as required by Government Code Section 8355(c), that every employee who works on the proposed contract or grant:

   (a) Will receive a copy of the company's drug-free policy statement, and
   (b) Will agree to abide by the terms of the company's statement as a condition of employment on the contract or grant.

Failure to comply with these requirements may result in suspension of payments under the contract or termination of the contract or both and the contractor or grantee may be ineligible for award of any future contracts if the department determines that any of the following has occurred: (1) the contractor or grantee has made false certification, or (2) violates the certification by failing to carry out the requirements as noted above.

Priority Hiring Considerations. For contracts in excess of $200,000, the contractor shall give priority consideration in filling vacancies in positions funded by the contract to qualified recipients of aid under Welfare and Institutions Code Section 11200. (Public Contract Code Section 10353).

ITEM 7

ONDISCRIMINATION COMPLIANCE STATEMENT

MPANY NAME

Hanson Environmental, Inc.

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

CERTIFICATION

I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.

FICIAL'S NAME

Charles H. Hanson

TE EXECUTED

June 28, 1998

EXECUTED IN THE COUNTY OF

Contra Costa

OSPECTIVE CONTRACTOR'S SIGNATURE

OSPECTIVE CONTRACTOR'S TITLE

Principal/CEO

OSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

Hanson Environmental, Inc.

ITEM 10

Agreement No. _____

Exhibit _____

NONCOLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID FOR PUBLIC WORKS

STATE OF CALIFORNIA)
)ss
COUNTY OF Contra Costa)

Charles H. Hanson (name), being first duly sworn, deposes and says that he or she is Principal/CEO (position title) of Hanson Environmental, Inc. (the bidder).

the party making the foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

DATED: June 28, 1998

By _____
(person signing for bidder)

Subscribed and sworn to before me on

_____

_____
(Notary Public)

(Notarial Seal)

I-010461