

FI-279

I. EXECUTIVE SUMMARY

DWR WATER QUALITY  
97 JUL 28 1994

a. **Project Title:** Source identification and transport of diazinon and chlorpyrifos in two major subbasins of the Merced River

**Applicant Name:** U.S. Geological Survey (USGS)

b. **Project Description:** California EPA and urban and agricultural water managers need to ascertain the principle pathways by which dormant spray pesticides are transported to surface water in order to develop management practices to reduce levels. This project will describe the mechanisms of transport by addressing the role of atmospheric deposition and identifying sources of diazinon and chlorpyrifos in two major subbasins of the Merced River.

c. **Approach/Tasks/Schedule:** This project will involve monitoring before and during two winter storms in late January or early February. The timing of storm sampling will depend on the local application of dormant spray pesticides. Transport of these pesticides to surface water occurs through atmospheric deposition, agricultural runoff, and urban runoff. Monitoring will occur in two major subbasins of the Merced River: Highline Canal and Livingston Canal (fig. 1). In a February 1994 storm, the USGS found that these two subbasins probably contributed most of the diazinon load to the Merced River. The California Department of Pesticide Regulation (CDPR) has also found consistently high diazinon concentrations in these two canals in their storm sampling.

Monitoring in the two subbasins will include total atmospheric deposition, wet deposition, and surface water sampling at sites along the canals to delineate urban and agricultural sources. Four to six samples will be collected at each site to represent temporal variability throughout the storm hydrograph. A dye study will be conducted on Highline and Livingston Canals during each storm to determine traveltime. This information will be used to interpret the water quality data.

d. **Justification for Project and Funding by CALFED:** Restoration of the anadromous fish and their food chain in the lower Merced and San Joaquin Rivers have been determined to be a high priority by CALFED. The levels of diazinon and chlorpyrifos in these rivers have frequently exceeded toxic levels during storms in January and February. These pesticides are stressors to

anadromous fish in instream aquatic habitats of the lower San Joaquin River Basin. Determination of sources and transport mechanisms for these pesticides is essential to development of best management practices to control their influx to the rivers.

**e. Budget Costs and Third Party Impacts:** Completion of the project will cost \$159,500 and will involve two senior hydrologists, a GIS/database expert, and several hydrologic technicians. There will be no third party impacts.

**f. Applicant Qualifications:** Dr. Charles Kratzer has a doctorate in Environmental Science and Engineering from the University of California, Los Angeles. He has been studying the water quality impacts of agricultural drainage in the San Joaquin Valley since beginning his doctoral research entitled "Agricultural Drainage Problems in the San Joaquin Valley". Dr. Kratzer served as the technical expert on San Joaquin Valley water resource issues for the State Water Resources Control Board from 1984 through 1991. He moved to the USGS in 1991 where he has continued to study the water quality of the San Joaquin River system as part of the USGS National Water Quality Assessment. Dr. Michael Majewski has a doctorate in Environmental Toxicology from the University of California, Davis. He has been at the USGS since 1991, also with the National Water Quality Assessment. Dr. Majewski has published many papers on airborne pesticides, including a book published by Ann Arbor Press entitled "Pesticides in the Atmosphere".

**g. Monitoring and Data Evaluation:** This entire project is a monitoring and data evaluation program. (see sections Ic and IIIa)

**h. Local Support/Coordination with other Programs/Compatibility with CALFED objectives:** There is no specific local sponsor, although CDPR will be providing field support for the project. The results of the project will be extremely useful to CDPR, the Regional Water Quality Control Board, and the Resource Conservation Districts in developing best management practices for dormant sprays.

Source Identification and Transport of Diazinon and  
Chlorpyrifos in two major subbasins of the Merced River

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RFP Project Group Type: Other Services

### III. PROJECT DESCRIPTION

#### a. Project Description and Approach

Chemical and bioassay monitoring have demonstrated that pesticides in the lower San Joaquin River Basin can persist for several days at concentrations toxic to sensitive aquatic organisms. The time period of greatest concern is during winter storms following application of dormant spray pesticides in orchards (primarily almonds). Some of these pesticides are used extensively for both agricultural and urban uses (especially, diazinon and chlorpyrifos) and have been detected in agricultural runoff, urban runoff, and precipitation.

California EPA and urban and agricultural water managers need to ascertain the principle pathways by which dormant spray pesticides are transported to surface water in order to develop management practices to reduce levels. This project will describe the mechanisms of transport by addressing the role of atmospheric deposition and identifying sources of diazinon and chlorpyrifos in two major subbasins of the Merced River.

This project will involve monitoring before and during two winter storms in late January or early February. The timing of storm sampling will depend on the local application of dormant spray pesticides. Transport of these pesticides to surface water occurs through atmospheric deposition, agricultural runoff, and urban runoff. Monitoring will occur in two major subbasins of the Merced River: Highline Canal and Livingston Canal (fig. 1). Highline Canal drains a 64 square mile agricultural basin with 24 square miles of almond orchards within the Turlock Irrigation District service area (fig. 2). Livingston Canal drains a 44 square mile area of urban and agricultural land use with 12 square miles of almond orchards within the Merced Irrigation District service area (fig. 3). In a February 1994 storm, the USGS found that these two subbasins probably contributed most of the diazinon load to the Merced River. The CDPR has also found consistently high diazinon concentrations in these two canals in their storm sampling.

Monitoring in the two subbasins will include total atmospheric deposition, wet deposition, and surface water sampling at sites along the canals to delineate urban and agricultural sources. Total atmospheric deposition (including dry deposition, fog deposition, and wet deposition) will be monitored at three

sites: in an agricultural area of the Livingston Canal subbasin, in an urban area of the Livingston Canal subbasin, and in an agricultural area of the Highline Canal subbasin. A total of 12 atmospheric deposition samples will be collected including six total deposition samples and six wet deposition samples. Dry deposition will be estimated from the difference of total deposition and wet deposition.

Monitoring in the Highline Canal subbasin will occur at 5-7 sites. These sites will include a site upstream of the major agricultural inputs, the spill to the Merced River, and 3-5 intermediate sites. These intermediate sites will define source areas.

Monitoring in the Livingston Canal subbasin will include 7-11 sites. These sites will include a site upstream of urban inputs from Castle AFB and the spill to the Merced River. The 5-9 intermediate sites will delineate urban sources from agricultural sources and will define source areas.

Four to six samples will be collected at each site to represent temporal variability throughout the storm hydrograph. A dye study will be conducted on Highline and Livingston Canals during each storm to determine traveltime. This information will be used to interpret the water quality data.

Overall data collection will include about 156 environmental samples plus 23 quality-control samples. All samples will be sent to the USGS National Water Quality Laboratory (NWQL) for analysis of 46 dissolved pesticides, including diazinon and chlorpyrifos. The method detection limits for diazinon and chlorpyrifos are 0.002 and 0.004 µg/L, respectively. The 23 quality-control samples will include replicates, blanks, and spikes.

**b. Location and/or geographic boundaries of project**

The study area for this project is the lower Merced River Basin, in Merced and Stanislaus Counties.

**c. Expected benefits**

Restoration of the anadromous fish and their food chain in the lower Merced and San Joaquin Rivers have been determined to be a high priority by CALFED. The levels of diazinon and chlorpyrifos in these rivers have frequently exceeded toxic levels during

storms in January and February. These pesticides are stressors to anadromous fish in instream aquatic habitats of the lower San Joaquin River Basin. This project will help define the source and mode of transport of diazinon and chlorpyrifos in the Merced River Basin, including the significance of atmospheric and urban sources.

The Merced River Basin is a major source of diazinon and chlorpyrifos to the San Joaquin River. Identification of the major sources and modes of transport is a necessary first step in the development of an effective contaminant control action which will potentially reduce toxicity in the San Joaquin River and the Delta during winter storms.

#### **d. Background and Biological/Technical Justification**

The runoff of dormant spray pesticides to the San Joaquin River is a stressor for anadromous fish in instream aquatic habitats of the Bay-Delta system. The runoff of dormant sprays increases the contaminant loads of diazinon and chlorpyrifos. Control actions need to start with identification of the pollutant sources and modes of transport.

Most proposals for changes in the management of the Bay-Delta system will change the physical flow system. These physical changes include, but are not restricted to, changes in the physical configuration affecting cross-Delta flow of Sacramento River water, structural changes in south Delta channels, and the timing and amount of pumping in relation to discharge from the Sacramento and San Joaquin Rivers. Under current conditions an unknown proportion of the streamflow in the San Joaquin River entering the Delta is exported from the Delta by the SWP and CVP pumps. Any change in the present physical flow system will change the amount of San Joaquin River water exported. Two classes of actions in particular will increase the net flux of San Joaquin River water into the Delta: actions taken to improve the water quality of exported water by reducing the amount of San Joaquin River water pumped; and any action (physical barriers or flow modification) taken to increase the survival of out-migrating salmonids from the San Joaquin River by increasing their rate of transport through the Delta. These actions will not only increase the net flux of San Joaquin River water into the Delta, but will increase the flux of contaminants transported by the river into the Delta.

Thus, it is important to reduce the stressor of contaminant loads in the San Joaquin River Basin. The present impact of these loads on anadromous fish could be exacerbated in the future if more San Joaquin River water reaches the Delta.

**e. Proposed Scope of Work**

This project has essentially 3 phases: pre-storm, storm, and post-storm. The pre-storm phase includes selecting sampling sites for atmospheric and surface-water samples, training some personnel (including CDFPR personnel) on sampling protocols (especially for atmospheric samples), and setting up equipment in the field prior to the storm events. The second phase is sampling the 2 storms. The third phase is analyzing the data and preparing an interpretive USGS report.

**f. Monitoring and Data Evaluation**

This entire project is a monitoring and data evaluation program. (see sections Ic and IIIa)

**g. Implementability**

The lead project personnel, Drs. Kratzer and Majewski, have successfully completed several storm sampling projects similar to this project over the past few years. Nevertheless, the successful completion of the project is subject to the occurrence of suitable storms in January and February. The USGS will match \$20,000 of the labor costs to help the cost-effectiveness of this project.

IV. COSTS AND SCHEDULE TO IMPLEMENT PROPOSED PROJECT

a. Budget Costs

Table 1: Cost Breakdown

Project Phase and Task	Direct Labor Hours	Direct Salary and Benefits	Overhead Labor (General, Admin and fee)	Service Contracts	Material and Acquisition Contracts	Misc. and other Direct Costs	Total Cost
Site selection	280	\$8,500	\$4,700			\$10,000	\$23,200
Sampling training	320	\$7,000	\$3,600			\$10,000	\$20,600
Equipment setup	160	\$3,000	\$1,600				\$4,600
Data collection	520	\$10,000	\$5,500			\$10,000	\$25,500
Obtain data			\$9,500			\$36,000	\$45,500
Data analysis	280	\$10,500	\$7,500				\$18,000
Report preparation	400	\$13,000	\$7,100			\$2,000	\$22,100
<b>TOTAL</b>	<b>1,960</b>	<b>\$52,000</b>	<b>\$39,500</b>			<b>\$68,000</b>	<b>\$159,500</b>

The total cost of the project is \$159,500. This total cost has been reduced by \$20,000 in matching funds from the USGS. These matching funds are from the Federal-State Cooperative Water Resources Program, and are subject to the availability of these funds at the time the grant is approved.

b. Schedule Milestones

Assuming that funding for this project would not be available until November 1997, the storm sampling would need to be delayed until January/February 1999 due to the lack of preparation time for 1998. Thus, the pre-storm phase would be completed by

January 1999. Storm sampling would occur in January/February 1999. The post-storm data analysis would be completed by September 1999, with a USGS interpretive report prepared by March 2000. If funding were available in early October 1997, the project could be moved forward by a year (i.e., sampling in January/February 1998 with a final report by March 1999).

**c. Third Party Impacts**

There will be no third party impacts.

**V. APPLICANT QUALIFICATIONS**

Dr. Charles Kratzer has a doctorate in Environmental Science and Engineering from the University of California, Los Angeles. He has been studying the water quality impacts of agricultural drainage in the San Joaquin Valley since beginning his doctoral research entitled "Agricultural Drainage Problems in the San Joaquin Valley". Dr. Kratzer served as the technical expert on San Joaquin Valley water resource issues for the State Water Resources Control from 1984 through 1991. He moved to the USGS in 1991 where he has continued to study the water quality of the San Joaquin River system as part of the USGS National Water Quality Assessment. Dr. Kratzer conducted a comprehensive study of diazinon transport in the San Joaquin River Basin in 1994. The study used real-time streamflow and rainfall data to determine appropriate sampling times, and a dye-tracer study to interpret sources of diazinon. The next year he conducted a study which looked at agricultural and urban sources of pesticides in the Modesto area of the Tuolumne River Basin.

Dr. Michael Majewski has a doctorate in Environmental Toxicology from the University of California, Davis. He has been at the USGS since 1991, also with the National Water Quality Assessment. Dr. Majewski has conducted many studies and published many papers on airborne pesticides, including a book published by Ann Arbor Press entitled "Pesticides in the Atmosphere".

**VI. COMPLIANCE WITH STANDARD TERMS AND CONDITIONS**

The USGS is in compliance with all specified terms and conditions with the exception of item 9 of Attachment D of the RFP. Federal law pertinent to this item is as follows:

The USGS agrees to cooperate to the extent allowed by federal

law, in submittal of all claims for alleged loss, injuries, or damage to persons or property arising from the acts of USGS employees, agents, subcontractors, or assigns, acting within the scope of their employment in connection with the performance of this agreement, pursuant to the Federal Tort Claims Act (28 U.S.C. §2671, et seq.).

This federal requirement has not been an obstacle in the past, as evidenced by our approximately 10 million dollars in cooperative agreements with numerous state and other public agencies that we entered in federal fiscal year 1998.

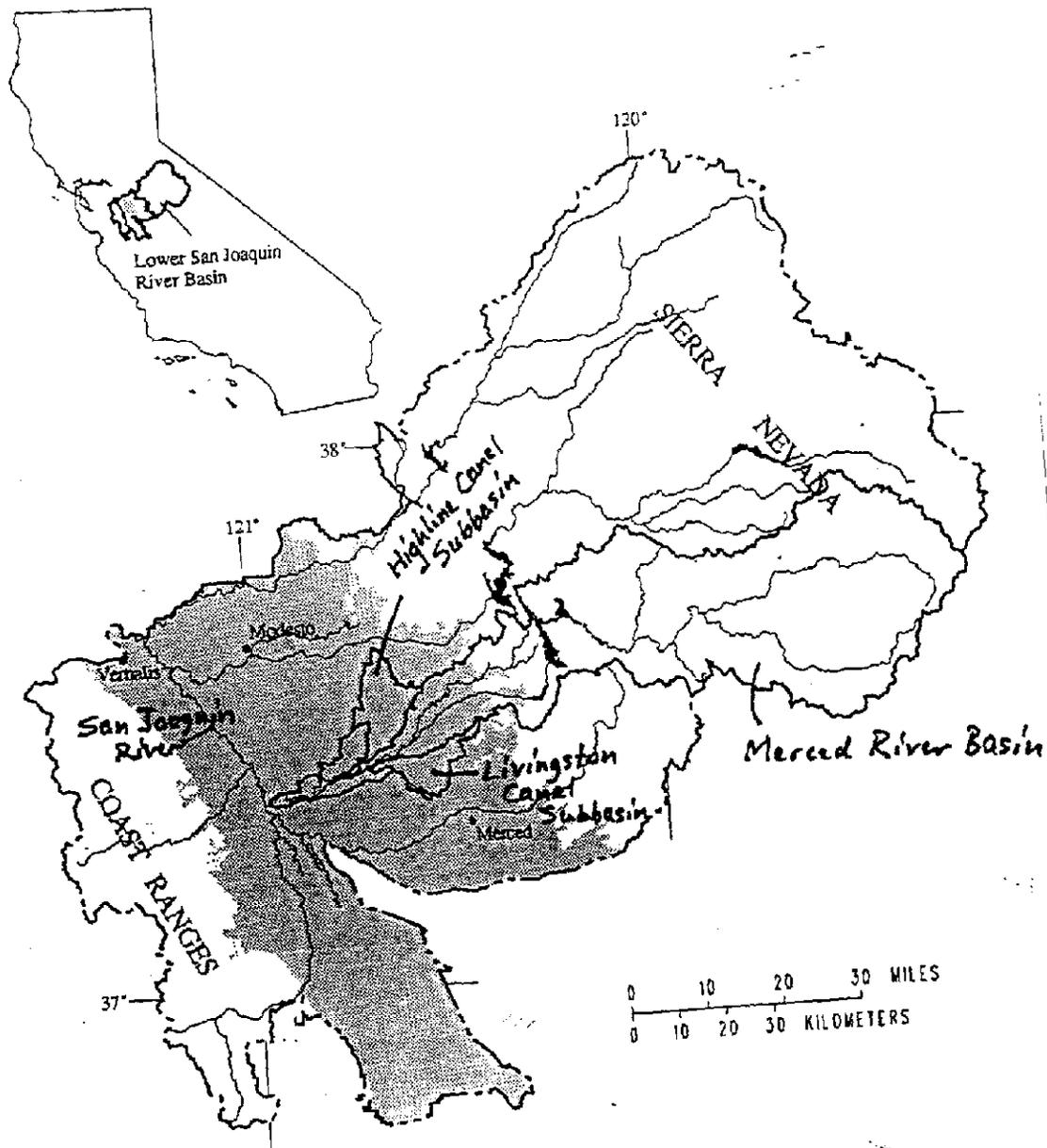
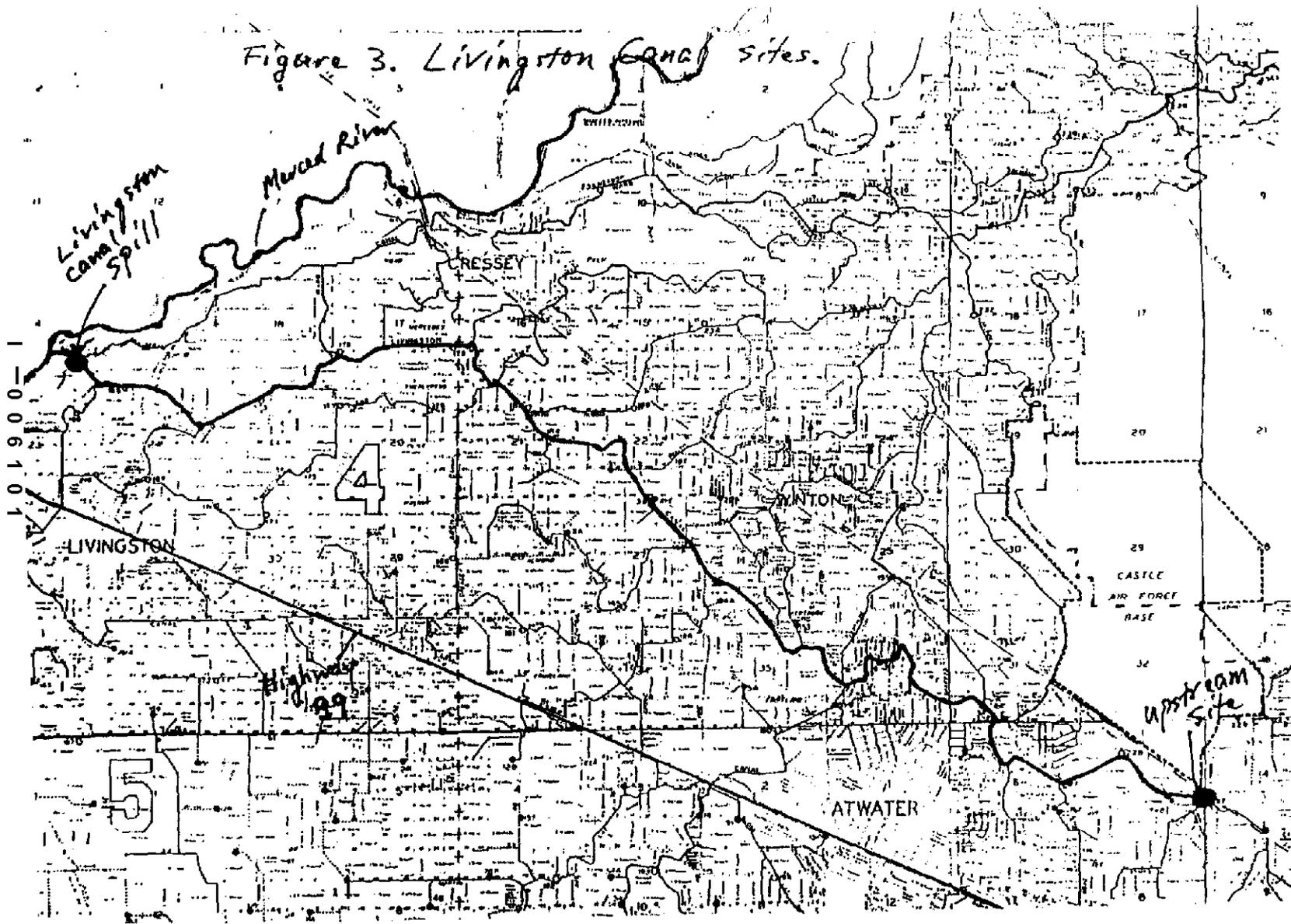


Figure 1. Map of the project area.



Figure 3. Livingston Canal sites.



## NONDISCRIMINATION COMPLIANCE STATEMENT

COMPANY NAME

U.S. Geological Survey

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 Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and 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 this date and in the county below, is made under penalty of perjury under the laws of the State of California.*

OFFICIAL'S NAME

Michael V. Sulters

DATE EXECUTED

July 25, 1997

EXECUTED IN THE COUNTY OF

Sacramento, California

PROSPECTIVE CONTRACTOR'S SIGNATURE



PROSPECTIVE CONTRACTOR'S TITLE

District Chief

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

U.S. Geological Survey