# *3-D Ocean State Simulations for Ecosystem Applications from 1995-1998 in Prince William Sound (PWS), AK*

| | |
|---|---|
| Project Number: | 01389 |
| Restoration Category: | Research |
| Proposer: | University of Alaska Fairbanks |
| Lead Trustee Agency: | ADFG |
| Cooperating Agencies: | |
| Alaska Sea Life Center: | No |
| Duration: | 2nd year, 2-year project |
| Cost FY 01: | $142.5 (includes: $69,184 plus 12K for computer and $52,080 subcontract plus ADFG GA) |
| Geographic Area: | Prince William Sound, Gulf of Alaska |
| Injured Resource/Service: | 3-D Modeling of PWS Ecosystem |


***ABSTRACT***

Using data collected from 1995–98 in PWS and the forcing of tide, coastal current inflow/outflow, freshwater discharge, and wind stress, a 3-D PWS model will be developed to produce continuous 4-year, 3-D fields of velocity, temperature, salinity, and mixing coefficients for resource managers, fishing industry, and biological applications. The interannual variability of PWS ocean circulation, and temperature and salinity due to interannually variable atmospheric forcing will also be studied. Thus, we can identify the key environmental parameters to be included in a long-term monitoring program to assist resource managers.

The supplement work (see the new task) for FY01 is to rescue the Sound Ecosystem Assessment (SEA) database and install it on a new server at IMS-IARC/UAF. The new server will serve future modeling studies for the Gulf Ecosystem Monitoring (GEM) program.

## *INTRODUCTION*

In the SEA program, extensive observations of phytoplankton and zooplankton, and oceanography, were made during 1995–98 (Cooney, 1996, 1997; McRoy et al. 1997; Thomas et al. 1997; Vaughan et al. 2000). Fish larvae and schools of selected species were also studied (Stokesbury et al. 1997). The 3-D ocean circulation model explains some, but not all of the mechanisms and applications to biology (Mooers and Wang 1998). For example, oceanic advection and diffusion can only explain the existing phytoplankton and zooplankton movement, while spring blooms and occasional later summer blooms (i.e., second bloom in the year) due to the ecosystem dynamics, cannot be explained by a physical-only model.

In 1998-99, substantial progress was made for the PWS ocean circulation modeling in the following areas:

1. We implemented a freshwater discharge of a line source into PWS (Wang et al. 1999) with support from SEA funding for Dr. M. Jin and continued conducting seasonal (12-month) simulations under climatological forcing and under seasonal forcing (1996) collaborating with Dr. S. Vaughan. The tidal forcing was also implemented to the forcing function (Fig. 1).

2. We conducted a (1996) seasonal 3-D simulation for Dr. T. Cooney of PWS zooplankton over wintering, releasing the particles from the depths below 400m on February 1 through July 30, 1996 (see Fig. 2), with an assumed mortality rate of 6% $day^{-1}$. The simulated results are consistent with what was been observed in 1996, according to Dr. T. Cooney.

3. We conducted a (1996) seasonal simulation for Dr. B. Norcross of spawning larvae migration along the a few selected locations (Fig. 3). The duration larvae retention in PWS has been found shorter by the change of the spawning location due to the 1989 T/V *Exxon Valdez* oil spill event. The mortality rate of 5% $day^{-1}$ was assumed.

4. We also provided 3-D velocity fields to E. Brown for her research (Brown et al. 1999). Brown found that physical forcing from the 3-D model fits well with her biological data. Thus, she strongly urges us to provide four consecutive years (1995–98) of the 3-D current velocity, temperature and salinity for her continuous proposal to EVOS.

5. Most recently, we collected the wind data from 1995–98 at a mid-Sound station (see Fig. 4) and other stations (not shown) with the efforts of Dr. Vince Patrick, Jenny Allen, and Stephen Bodnar (the first-year subcontract). These data have a 30min interval. We will average them to hourly or 3-hourly interval to drive the model and use that to examine the year-to-year variability of the circulation due to wind forcing.

## *NEED FOR THE PROJECT*

### *A. Statement of Problem*

1. Use 1995–98 CTD observations combined with the historical CTD observation from 1975–94 to produce updated climatology of T and S for each levels (such as surface, 5m, 10m, etc.). This will be collaborated with Alaska Digital Graphics.

2. Use 1995–98 wind speeds and directions at nine weather stations around PWS to produce four-year spatial varying wind fields. This will be collaborated with Alaska Digital Graphics.

3. Calculate 1995–98 freshwater discharge using a hydrological model under forcing of air temperature, river runoff, and precipitation.

4. Using 1-3 the above as forcing, we will simulate the 3-D PWS ocean circulation, T, S, etc. using the 3-D-PWS model (Wang et al. 1999 a,b) to provide biologists and resource managers with applications of the physical forcing model.

5. Analyse continuous 48-month interannual variability of PWS circulation, T, S, and other variables under atmospheric forcing.

6. Rescue the SEA database by moving it to a new server to be located at IMS-IARC/UAF.

***B. Rationale/Link to Restoration***

Prince William Sound (PWS or the Sound) is located along Alaska's south central coast, north of the Gulf of Alaska (GOA). PWS is a combination of fjords and estuaries along the coast of Alaska, which was formed by a combination of preglacial erosion, glacial excavation, and tectonics. Because of its rich natural resources, i.e., sea birds, mammals, salmon, forage fish, etc., a systematic numerical simulation (study) of the physical oceanography and ecosystem in the region is essential and timely. It is necessary to understand the physical-biological system in order to provide sound scientific knowledge and information to the state government, local communities and others whose decisions or use affect the health and vitality of the Sound.

There were few historical observational studies of PWS before 1989. When North America's largest oil spill by T/V *Exxon Valdez* (March 24, 1989) seriously damaged the PWS ecosystem and the adjacent downstream waters, such as Cook Inlet and Kachemak Bay, extensive observational programs were begun in region. The SEA (Sound Ecosystem Assessment) project is one of the major programs. This interdisciplinary project started in 1994 with major focus on pink salmon, Pacific herring habitat, ecology, and physical oceanography. As the physical component of this project, effort was placed on field programming and numerical modeling.

After the implementation of 3-D-PWS model and a passive tracer simulation were accomplished (Mooers and Wang 1998; Deleersnijder et al 1998), a seasonal simulation (12 consecutive months) was followed up by Wang et al. (2000) using the SEA observations of 1996 only (Fig. 1). However, field observations in physical and biological oceanography from 1995–98 during the SEA program have not been fully validated. In addition, the interannual variability as observed (Vaughan et al. 2000) cannot be explained in terms of numerical modeling alone. Thus, after SEA it is necessary to synthesize both observations and multi-year modeling simulations for 1995–98.

Therefore, it is highly appropriate to use the data that has already been collected during the SEA project synthesized with data from other sources for this multi-year oceanographic model simulation. The simulated results will be valuable to assist resource managers to forecast pink salmon and Pacific herring abundance and to anticipate or understand changes in the ecosystem. In addition, key elements will be identified that will be pertinent to include in a long-term monitoring

program, leading to an establishment of a nowcast/forecast system in PWS using this 3D-PWS model.

### *C. Location*

The research conducted for the ecosystem of Prince William Sound, Alaska will help us understand the basic physical forcing of the Sound and greatly benefit the biological research community and resource managers. The observed data used in the model are from the observations conducted in PWS between 1995–98. The modelling will be done using the resources of the University of Alaska Fairbanks and IARC-Frontier.

## *COMMUNITY INVOLVEMENT AND TRADITIONAL KNOWLEDGE*

Research institutions such as IMS and IARC of UAF and local community organizations such as the Regional Citizens' Advisory Council (RCAC) in Cordova and around Cook Inlet will be involved in this project. Both groups are concerned with possible long-term oil spill impact on the ecosystem and on the local communities as well.

## *PROJECT DESIGN*

### *A. Objectives*

1. Using the 3D-PWS model to simulate 1995–98 ocean circulation, T, S, vertically mixing coefficients using 2.5 turbulence closure model. The model validation will be conducted using actual observations during the four years.

2. Provide biologists and resource managers the 3-D fields (longitude, latitude, and depth) of velocity, T, S, etc. of 1995–98.

3. Conduct 48-month simulation of zooplankton over wintering for each year to compare the early spring distribution, the late spring-summer distribution, and the year-to-year difference (interannual variability).

4. Rescue the SEA database from PWSSC and install it with new data and information on a new server located at IMS-IARC/UAF.

### *B. Methods*

The above objective will be implemented with the method of physical and biological data analysis and 3-D PWS numerical model.

1. Forcing data

    i. Winds. The hourly wind speeds and directions will be analysed at the nine stations around PWS used in Wang et al. (1999). Using nine wind-fetch empirical models, the

winds will be interpolated into the model grids from 1995–98. This work will be subcontracted to Alaska Digital Graphics.

ii. The SEA CTD data from 1995–98. All the CTD data from SEA, both physical oceanography observations and biological observations will be collected to produce seasonal T and S distribution from 1995–98. This work will be also collaborated with Dr. Vaughan at PWSSC to provide us the data.

iii. The hydrological model for freshwater discharge into PWS will be run to produce the 4-year daily runoff. The work will be done at UAF.

iv. Monthly heat flux for the same period will be extracted from the COADS.

v. The monthly inflow/outflow will be fixed to the observations of Niebauer et al. (1994).

2. Model simulations

The ocean circulation (physical) model should refer to the studies of Wang and Ikeda (1996), Wang et al. (1997), Mooers and Wang (1998), and Wang et al. (1999).

A continuous 48-month simulation will be conducted under the forcing described above and tidal forcing, beginning from January 1995 to December 1998. The outputs will be validated based on actual observations. Then, the model outputs (velocity, T, S, mixing coefficients, etc.) will be provided in 3D grids to biologists to verify their phytoplankton and zooplankton data. The four years interannual variability will be analysed to confirm what (i.e., which forcing factor) causes interannual variability, and their relative importance for interannual variability.

### *C. Cooperating Agencies, Contracts, and Other Agency Assistance*

Data preparation will be subcontracted to Alaska Digital Graphics. The observations of SEA Project in 1995–98 were collected by them and we had very fruitful collaboration during the course of this project.

The PI was also recently funding by the Oil Spill Recovery Institute (OSRI) for one-year ($50K) of the two-year proposal titled “A 3-D coupled biological-physical model for the ecosystem in PWS, Alaska.” This project will benefit the present proposed research by paying half of the time for Dr. Jin, who will be doing the intensive modeling work.

## *SCHEDULE*

### *A. Measurable Project Tasks for FY 01 (October 1, 2000 – September 30, 2001)*

| | |
|---|---|
| December 31: | Complete tide simulation and validation with the four years of observations |
| January 18–28 (3 of these days): | Attend Annual Restoration Workshop |
| March 31: | Complete preparing the forcing data of the four years |

| | |
|---|---|
| August 31: | Complete the modelling of 1995–1998 |
| September 15: | Submit manuscript to peer viewed journal |

***B. Project Milestones and Endpoints***

| | |
|---|---|
| March 15, 2001: | Complete the analysis of interannual variability of the ocean circulation and the ecosystem in PWS |
| April 15, 2001: | Submit annual report (FY 00) |
| August 15, 2001: | Complete the modelling of zooplankton over wintering |
| September, 30, 2001: | Submit final report and second manuscript |

***(New Task for 2001)***

Please note that in the first year proposal, the PI (Wang) only proposed a one year subcontract to Dr. Vince Patrick, Jenny Allen and Stephen Bodnar formerly of the Prince William Sound Science Center, now Alaska Digital Graphics. Now, with the realization that PWSSC SEA server has been down since Patrick, Allen and Bodnar left the Center, much of the data has not been retrieved and may be lost if we do not immediately rescue the database collected during the SEA program.

Therefore, I propose to apply for 2001 budget from EVOSTC that includes funding for a subcontract to Alaska Digital Graphics to transfer the database from PWSSC to a new server located at IMS-IARC/UAF. The new task includes:

1) Budgeting for a UNIX workstation ($12K) to sit at IMS-IARC/UAF as a server for SEA database and be available for future GEM modeling projects.
2) Allen: 2.5 month for making the 1995-98 model outputs into the database and adding new data to the new computer server;
   Bodnar: 1.5 months for retrieving the SEA database and installing in on the new server;
   Patrick: 1.5 months for retrieving the SEA Information System and installing it on the new server.

The retrieved database in the IMS-IARC/UAF server will be serve incoming GEM projects with a focus on numerical simulations and provide a level of continuity that would not be available without this data. The breakdown of the SEA Information System and the server at PWSSC after a five-year investment by EVOSTC is a lesson we all should learn. Thus, it is very important to keep alive the data that scientists have collected during the last five-year SEA project.

***C. Completion Date***

September 30, 2001

***PUBLICATIONS AND REPORTS***

Manuscript titled "Tidal current and tidal residual current in PWS" (to be submitted to the *Journal of Geophysical Research-Oceans*) will be prepared and submitted to a refereed journal for formal publication. I may present the results and publish another paper in the book titled *Computer Modeling of Seas and Coastal Regions, V, 2001* in which I serve as a member of the International

Advisory Committee for three years now. In the second year, we plan to submit a paper titled "Simulating interannual variability of ocean circulation of PWS, Alaska" to the *Journal of Geophysical Research*, another manuscript titled *Impact of Ocean Circulation on Ecosystem in PWS, 1995-1998*.

## *PROFESSIONAL CONFERENCES*

The PI and Dr. Jin plan to attend the annual EVOS meeting, 2000 Fall AGU Meeting in San Francisco, presenting the updated research results. This is an excellent way to communicate with our colleagues and to get recognised in the ocean science community. During the first year, we will travel to Anchorage discussing with Allen (or Allen will visit Fairbanks) regarding data processing and analysis.

## *COORDINATION AND INTEGRATION OF RESTORATION EFFORT*

This proposed research will be co-ordinated with 1) E. Brown's project (if her proposal gets funded) by providing her with the model outputs; 2) S. Vaughan's proposal for continuous monitoring project; 3) J. Allen's proposal for animation of 3-D model outputs, and other potential proposals for the restoration effort. We are willing to provide our 4-year simulation outputs to all EVOS-funded proposals by putting our simulation results on our web in both digital and graphic formats.

## *PROPOSED PRINCIPAL INVESTIGATOR*

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jwang@iarc.uaf.edu

### *PRINCIPAL INVESTIGATOR*

Dr. Jia Wang, the PI, will be involved in the entire course of the project, providing scientific guidance to the project, without claiming salary. (The PI's salary will be funded by IARC-Frontier funds.) The PI needs one graduate student to conduct hydrological modeling to produce 48-months of freshwater runoff along the PWS coasts. Also, the PI will oversee the rescue of the SEA database and addition of new information into the new server.

### *OTHER KEY PERSONNEL*

Dr. Meibing Jin, who is currently working on this EVOS-funded project awarded to the PI (Wang), will continue conducting the simulation and will be partially supported by the OSRI fund for six months.

The data preparation and server construction for rescuing the SEA database will be subcontracted to Dr. Patrick, Allen and Bodnar of Alaska Digital Graphics. Their collaboration will be essential for success of this proposed research.

### *LITERATURE CITED*


Brown, E.D., J. Wang, S.L. Vaughan, and B.L. Norcross, 1999. Identifying seasonal spatial scale for the ecological analysis of herring and other forage fish in Prince William Sound, Alaska. *In Ecosystem Approaches for Fisheries Management*, Alaska Sea Grant College Program AK-SG-99-01 (in press)

Cooney, T. 1996. SEA–An Integrated Science Plan for the Restoration of Injured Species in Prince William Sound. EVOS FY 1996 Annual Report.

Cooney, T. 1997. SEA–An Integrated Science Plan for the Restoration of Injured Species in Prince William Sound. EVOS FY 1996 Annual Report.

Deleersnijder, D., J. Wang, and C. Mooers. 1998. A two-compartment model for understanding the simulated three-dimensional circulation in Prince William Sound, Alaska. *Cont. Shelf Res.*, 18: 279–287.

Eslinger, D.L. 1997. Biological modeling and validation through remote sensing. *In* Chapter 5, SEA–An Integrated Science Plan for the Restoration of Injured Species in Prince William Sound. T. Cooney (ed.). EVOS FY 1997 Annual Report.

McRoy, C.P. 1997. Sound ecosystem analysis: phytoplankton and nutrients. *In* Chapter 3, SEA–An Integrated Science Plan for the Restoration of Injured Species in Prince William Sound. T. Cooney (ed.). EVOS FY 1997 Annual Report.

Mooers, C.N.K. and J. Wang. 1998. On the implementation of a 3-D circulation model for Prince William Sound, Alaska. *Cont. Shelf Res.,* 18: 253–277.

Niebauer, H.J., T.R. Royer, and T.J. Weingartner, 1994. Circulation of Prince William Sound, Alaska. *J. Geophys. Res.,* 99: 14,113–14,126.

Stokesbury, K.D.E., E.D. Brown, R.J. Foy, and B.L. Norcross. 1997. Juvenile herring growth and habitats. *In* Chapter 11, SEA–An Integrated Science Plan for the Restoration of Injured Species in Prince William Sound. T. Cooney (ed.). EVOS FY 1997 Annual Report.

Thomas, G.L., K. Jay, G. Steinhart, and N. Peters. 1997. Nekton-plankton acoustics. *In* Chapter 10, SEA–An Integrated Science Plan for the Restoration of Injured Species in Prince William Sound. T. Cooney (ed.). EVOS FY 1997 Annual Report.

Vaughan, S.L. C.N.K. Mooers, J. Wang, S.M. Gay, and L.B. Tuttle. 2000. Physical processes that influence the biological components of Prince William Sound (submitted to the SEA Synthesis Volume)

Wang, J. and M. Ikeda. 1996. A 3-D ocean general circulation model for mesoscale eddies-I: meander simulation and linear growth rate, *Acta Oceanologica Sinica*, 15: 31–58.

Wang, J., C.N.K. Mooers, and V. Patrick. 1997. A three-dimensional tidal model for Prince William Sound, Alaska. *In* Computer Modelling of Seas and Coastal Region III, J.R. Acinas and C.A. Brebbia (eds.), Computational Mechanics Publications, Southampton, pp 95–104.

Wang, J., V. Patrick, J. Allen, and M. Jin. 1999a. Modeling seasonal ocean circulation of Prince William Sound, Alaska using freshwater of a line source. *In* Computer Modelling of Seas and Coastal Region IV, C.A. Brebbia, et al. (eds.), Computational Mechanics Publications, Southampton (in press).

Wang, J., M. Jin, V. Patrick, J. Allen, C. Mooers, D. Eslinger, and T. Cooney. 2000. A simulation of the seasonal ocean circulation patterns/regimes of Prince William Sound, Alaska, 1996. *Fisheries Oceanography* (SEA Synthesis Volume; conditionally accepted).

**2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET**

October 1, 2000 - September 30, 2001

| Budget Category: | Authorized FY 2000 | Proposed FY 2001 | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Personnel | | $0.0 | | | | | | |
| Travel | | $0.0 | | | | | | |
| Contractual | | $133.2 | | | | | | |
| Commodities | | $0.0 | | | | | | |
| Equipment | | $0.0 | LONG RANGE FUNDING REQUIREMENTS | | | | | |
| Subtotal | | $133.2 | | | Estimated | Estimated | | |
| General Administration | | $9.3 | | | | | | |
| Project Total | | $142.5 | | | | | | |
| Full-time Equivalents (FTE) | | 1.3 | | | | | | |
| | Dollar amounts are shown in thousands of dollars. | | | | | | | |
| Other Resources | | | | | | | | |

Comments:

**FY01**

Prepared:

Project Number: 01389
Project Title: 3-D Ocean State Simulations for Ecosystem Applications from 1995-1998 in Prince William Sound (PWS), AK.
Agency: Alaska Department of Fish and Game



| Budget Category: | Authorized FY 2000 | Proposed FY 2001 |
|---|---|---|

**2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET**

October 1, 2000 - September 30, 2001

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| Personnel | | $43.7 | | | | | | |
| Travel | | $2.2 | | | | | | |
| Contractual | | $52.1 | | | | | | |
| Commodities | | $0.9 | | | | | | |
| Equipment | | $12.0 | LONG RANGE FUNDING REQUIREMENTS | | | | | |
| Subtotal | | $110.9 | | | Estimated | Estimated | | |
| Indirect | | $22.3 | | | | | | |
| Project Total | | $133.2 | | | | | | |
| | | | | | | | | |
| Full-time Equivalents (FTE) | | 1.3 | | | | | | |
| | Dollar amounts are shown in thousands of dollars. | | | | | | | |
| Other Resources | | | | | | | | |

Comments:

The indirect rate is 25% TDC (5% for subcontract amounts over $25,000), as negotiated by the Exxon Valdez Oil Spill Trustee Council with the University of Alaska.

Student personnel costs include non-resident tuition of $5,868 per year.

**FY01**

Prepared:

Project Number: 01389
Project Title: 3-D Ocean State Simulations for Ecosystem Applications from 1995-1998 in Prince William Sound (PWS), AK.
Name: Jia Wang

| **Personnel Costs:** | | | | Months | Monthly | | |
|---|---|---|---|---|---|---|---|
| | Name | Position Description | | Budgeted | Costs | Overtime | |
| | M. Jin | Research Assistant Professor | | 6.0 | 4.8 | | |
| | TBA | Graduate Student | | 9.3 | 1.6 | | |

**2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET**
October 1, 2000 - September 30, 2001

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | Subtotal | | 15.3 | 6.4 | 0.0 | |
| | | | | | | **Personnel Total** | |

| **Travel Costs:** | | Ticket | Round | Total | Daily | |
|---|---|---|---|---|---|---|
| | Description | Price | Trips | Days | Per Diem | |
| | R/T Fairbanks to San Francisco (AGU Meetings) | 0.6 | 1 | 4 | 0.2 | |
| | R/T Fairbanks to Anchorage | 0.5 | 1 | 3 | 0.1 | |
| | | | | | **Travel Total** | |

**FY01**

Prepared:

Project Number: 01389
Project Title: 3-D Ocean State Simulations for Ecosystem Applications from 1995-1998 in Prince William Sound (PWS), AK.
Name: Jia Wang

| **Contractual Costs:** | |
|---|---|
| Description | |
| Subcontract: Alaska Digital Graphics | |

**2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET**
October 1, 2000 - September 30, 2001

| | |
|---|---|
| **Contractual Total** | |
| **Commodities Costs:** | |
| Description | |
| Project Supplies (Telephone, Copying, Postage, Etc.) | |
| **Commodities Total** | |

**FY01**

Prepared:

Project Number: 01389
Project Title: 3-D Ocean State Simulations for Ecosystem Applications from 1995-1998 in Prince William Sound (PWS), AK.
Name: Jia Wang

**2001 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET**

October 1, 2000 - September 30, 2001

| **New Equipment Purchases:** | Number of Units | Unit Price | |
|---|---|---|---|
| Description | | | |
| Workstation/Server | 1 | 12.0 | |
| Those purchases associated with replacement equipment should be indicated by placement of an R. | | **New Equipment Total** | |

| **Existing Equipment Usage:** | Number of Units | |
|---|---|---|
| Description | | |

**FY01**

Prepared:

Project Number: 01389
Project Title: 3-D Ocean State Simulations for Ecosystem Applications from 1995-1998 in Prince William Sound (PWS), AK.
Name: Jia Wang

**FY 99 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET**
October 1, 1998 - September 30, 1999

| Budget Category: | Authorized FY 2000 | Proposed FY 2001 |
|---|---|---|
| Personnel | | $40.8 |
| Travel | | $1.2 |
| Contractual | | $1.0 |
| Commodities | | $0.4 |
| Equipment | | $0.0 |
| Subtotal | | $43.4 |
| Indirect (0.2xTDC) | | $8.68 |
| Project Total | | $52.1 |
| Full-time Equivalents (FTE) | | 0.5 |
| Other Resources | | |

| LONG RANGE FUNDING REQUIREMENTS | | |
|---|---|---|
| | Estimated FY 2002 | Estimated FY 2003 |
| | $0.0 | $0.0 |

Dollar amounts are shown in thousands of dollars.

Comments:

*Please note:*

This form contains the budget detail for the proposed subcontract to Alaska Digital Graphics within proposal #01389.

It corresponds to the $52.1K line contractual services line item within the previously submitted budget for #01389.

**FY 01**

Prepared 04/28/00

Project Number: **01389 - detail of subcontract to ADG**
Project Title:
Name:
Agency: ADF&G

| **Personnel Costs:** | | | | Months Budgeted | Monthly Costs | Overtime | |
|---|---|---|---|---|---|---|---|
| | Name | Position Description | | | | | |

**FY 99 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET**
October 1, 1998 - September 30, 1999

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | J.R. Allen | | | 2.5 | 6.9 | | |
| | S. Bodnar | | | 1.5 | 7.2 | | |
| | V. Patrick | | | 1.5 | 8.5 | | |
| | | | Subtotal | 5.5 | 22.6 | 0.0 | |
| | | | | | | **Personnel Total** | |

| **Travel Costs:** | | Ticket | Round | Total | Daily | |
|---|---|---|---|---|---|---|
| | Description | Price | Trips | Days | Per Diem | |
| | 1 R/T Anch-Fbx including per diem | 0.4 | 1 | 8 | 0.1 | |
| | | | | | **Travel Total** | |

**FY 01**

Prepared 04/28/00

Project Number: **01389 - detail of subcontract to ADG**
Project Title:
Name:
Agency: ADF&G

| **Contractual Costs:** |
|---|
| Description |
| computing/telecommunications |
| telephone/fax |

**FY 99 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET**
October 1, 1998 - September 30, 1999

| | |
|---|---|
| | |
| **Contractual Total** | |
| **Commodities Costs:** | |
| Description | |
| media and materials | |
| **Commodities Total** | |

**FY 01**

Prepared 04/28/00

Project Number: **01389 - detail of subcontract to ADG**
Project Title:
Name:
Agency: ADF&G

| **New Equipment Purchases:** | Number of Units | Unit Price | |
|---|---|---|---|
| Description | | | |
| none | | | |

**FY 99 EXXON VALDEZ TRUSTEE COUNCIL PROJECT BUDGET**
October 1, 1998 - September 30, 1999

| | | | | |
|---|---|---|---|---|
| | | | | |
| Those purchases associated with replacement equipment should be indicated by placement of an R. | | | **New Equipment Total** | |
| **Existing Equipment Usage:** | | | Number | |
| Description | | | of Units | |
| | | | | |

**FY 01**

Prepared 04/28/00

Project Number: **01389 - detail of subcontract to ADG**
Project Title:
Name:
Agency: ADF&G