

Operational Requirements Worksheet

United States Antarctic Program (USAP)

Project Title:

Palmer, Antarctica Long Term Ecological Research Project:
Climate migration, ecological response and teleconnections in
an ice-dominated environment.

Title Extension:

Principal Investigator: Dr. Hugh Ducklow

Seasons:

2002 - 2003

2003 - 2004

2004 - 2005

2005 - 2006

2006 - 2007

2007 - 2008

Applicant Version

Section 1.0 - Principal Investigator and Contacts

Please enter Principal Investigator, co-Principal Investigator, and collaboration information in the fields below. For further assistance in filling out these forms, please refer to the help documentation.

- Principal Investigator (PI):

<p>Dr. Hugh W. Ducklow</p> <p>College of William and Mary</p> <p>School of Marine Science</p> <p>Rte 1208 Greate Rd.</p> <p>PO Box 1346</p> <p>Gloucester Point, VA 23062-1346</p> <p>United States</p> <p><i>Tel:</i> 001 (804)684-7180</p> <p><i>Fax:</i> 001 (804)684-7293</p> <p>duck@vims.edu</p>
--

- Co-Principal Investigator:
- Is this proposed work to be done in collaboration with investigators writing separate proposals? Yes No
- Provide anticipated number of foreign participants (NOTE: This will require NSF approval): 0

Section 2.0 - Project Information

- If you would like to change the above Title Extension, enter the new extension in the field below:
- Please specify the Ships, Stations, and Field Sites you plan to visit.

Season: 2002 - 2003

Station / Vessel	# in Party	From Date	To Date	Site Activity
Laurence M. Gould		04/15/2003	04/17/2003	periodic mooring service during LMG transits (every 3-4 months)
Laurence M. Gould		07/01/2003	07/03/2003	periodic mooring service during LMG transits (every 3-4 months)
Laurence M. Gould		10/01/2003	10/03/2003	periodic mooring service during LMG transits (every 3-4 months)
Laurence M. Gould		01/02/2003	02/11/2003	Hydrographic and ecological survey of LTER Grid
Palmer Station		10/15/2002	04/01/2003	Field sampling and experimental work

Season: 2003 - 2004

Station / Vessel	# in Party	From Date	To Date	Site Activity
Laurence M. Gould		01/02/2004	02/11/2004	Hydrographic and ecological survey of LTER Grid
Palmer Station		10/15/2003	04/01/2004	Field sampling and experimental work

Season: 2004 - 2005

Station / Vessel	# in Party	From Date	To Date	Site Activity
Laurence M. Gould		01/02/2005	02/11/2005	Hydrographic and ecological survey of LTER Grid
Palmer Station		10/15/2004	04/01/2005	Field sampling and experimental work

Season: 2005 - 2006

Station / Vessel	# in Party	From Date	To Date	Site Activity
Laurence M. Gould		01/02/2006	02/11/2006	Hydrographic and ecological survey of LTER Grid
Palmer Station		10/15/2005	04/01/2006	Field sampling and experimental work

Season: 2006 - 2007

Station / Vessel	# in Party	From Date	To Date	Site Activity
Laurence M. Gould		01/02/2007	02/11/2007	Hydrographic and ecological survey of LTER Grid
Palmer Station		10/15/2006	04/01/2007	Field sampling and experimental work

Season: 2007 - 2008

Station / Vessel	# in Party	From Date	To Date	Site Activity
Laurence M. Gould		01/02/2008	02/11/2008	Hydrographic and ecological survey of LTER Grid
Palmer Station		10/15/2007	04/01/2008	Field sampling and experimental work

- If proposing vessel research, can the work be accomplished ONLY on the US Antarctic Program research vessels you specified above? Yes No

Section 2.0 - Project Information

(For further information on the capabilities of the R/V LAURENCE GOULD or the R/V NATHANIEL B. PALMER, please refer to the Online Help.)

- Describe your science objectives:

1. Maintain annual oceanographic sampling on the full PAL-LTER grid stations off West Antarctic Peninsula.

2. Define and investigate seasonal scale processes (plankton succession, krill recruitment, penguin breeding cycle) in the vicinity of Palmer Station using Zodiac-based local sampling.

3. Perform process-level experimental research on coastal Antarctic populations and biogeochemical cycles using lab-based approaches at PAL.

4. Install an array of autonomous sensors and data recorders/transmitters to facilitate physical & biological data collection at higher frequency and in seasons or regimes where manned sampling is not feasible.

5. Using an array of multivariate statistical techniques, investigate and analyze the long-term patterns and trends in the decade-long LTER data sets pertaining both to spatial pattern on the LTER grid, and temporal variability in meteorology, sea ice extent and duration, ocean color, plankton and biogeochemical properties; and secular trends in ecosystem response to climate change.

6. Understand the mechanistic linkages between physical and ecological processes governing Antarctic marine ecosystem organization and change.

Section 2.0 - Project Information

- Briefly summarize how you will be conducting research in Antarctica (refer to the online help for instructions on completing this question):
 1. For Objective 1 and 4 above: annual 28-day cruise (Palmer Station to Palmer Station) aboard LMG or NBP. The ship dates specified above include transits and time at the dock at PAL.
 2. For objectives 2, 3, 4: season-long (October- April) stays by up to ten persons at Palmer Station, primarily relying on Zodiac-based sampling.
 3. For objectives 2,3,4 acquire and install new moored autonomous physical- and biological-optical sensor systems in the Palmer Station nearshore and offshore (LTER grid) region (eg, underwater profiling systems).

NB: installation and servicing of moorings will require LMG shiptime -- ca. 0.5 day per mooring. This can be accomplished during LMG shuttle trips to/from PAL. Moorings will need to be serviced every 3-4 months, at least initially. About 1-2 days on quarterly LMG shuttle trips will be needed in Years 1 - 3.

NB: this project (H Ducklow, BP-045, lead PI) also includes integral participation by the following co-PI's and their teams:

co-PI Raymond Smith BP-032
co-PI Maria Vernet BP-016
co-PI Bill Fraser BP-013
co-PI Robin Ross BP-028
co-PI Langdon Quetin BP-028
co-PI Doug Martinson BP-021

We will maintain at least one PI or an experienced senior technician or post-doc at Palmer Station at all times during each field season. We hope to have all PI's at Palmer about every other year at a minimum.

Several PI's will participate in each summer cruise aboard the LMG.

For other operational details, please refer to earlier LTER ORW and SIP submissions. This project involves no substantial revision in scope or needs, with the exception of installation of new autonomous sensors in the PAL region.

- If your project requires support from Ice Core Drilling Services (ICDS), the USAP drilling contractor, please describe below:

Please include locations, number of corings, and approximate depth.

Section 3.0 - Safety Environment and Health

Please check each item that describes your proposed activities. For further information about documents and forms mentioned in the text, please refer to the help documentation.

- Underwater Diving? Yes No

You will need to meet USAP Scientific Diving Program requirements (see "Antarctic Scientific Diving Manual" [NSF 98-148]). You will be asked to provide details of your proposed diving plan at a later date.)

- Use of explosives? Yes No
- Conduct remote field deployment? Yes No
- Use of radioisotopes? Yes No

Researchers proposing to use radioactive materials (open or sealed sources) in Antarctica must comply with USAP Radiation Safety policies and those of their home institution. Please complete Section 4.0 of this document, "Use of Radioactive Materials"

- Involvement of human subjects? Yes No

Researchers proposing to involve humans in their research must comply with Federal regulations regarding the protection of human subjects (45 CFR 46 - Part 46).

- Perturbation experiments, i.e., re-routing water flow or manipulating the habitat of birds or mammals? Yes No
- Ice, rock, or sediment coring? Yes No
- Release of materials into the environment such as drilling fluids, bioactive materials, inorganic tracers, sampling equipment, etc.? Yes No

❖ Type of material:

XBT's and XCTD's from LMG.

- Excavation requiring the use of heavy equipment? Yes No
- Placement of temporary scientific equipment for more than one season that may be irretrievable (e.g., probes, detectors, cables, antennae, towers, benchmarks, monuments, etc.)? Yes No
- Emitting or receiving radio frequency (RF) or microwave energy? Yes No
- Bringing non-indigenous species to the antarctic? Yes No
- Generating or releasing large volumes of hazardous waste materials? Yes No

Section 3.0 - Safety Environment and Health

Please complete Section 5.0 of this document, "Estimate of Hazardous Amounts of Chemical Waste"

- Activities involving native flora/fauna and/or entry into specially designated areas? Yes No

You may be required to submit an ACA permit request. It is your responsibility to be informed about all relevant ACA regulations concerning native flora/fauna and specially designated areas.

- Please briefly describe any other proposed activities that you believe may affect the antarctic environment or any future scientific investigations:

Section 4.0 - Radioactive Materials

The use of radioactive materials (open and sealed sources) in Antarctica requires strict adherence to the Antarctic Conservation Act and the license conditions specified in your institution's U.S. Nuclear Regulatory Commission or state licensing authority's radioactive materials use license.

- Please identify the radioisotopes you plan to use in Antarctica.

Isotope	Other	Chemical Form or Sealed Source	Activity (mCi)	From Date	To Date
3-H		aqueous, organic compounds	50.	10/15/2002	04/01/2003
14-C		bicarbonate	100.	10/15/2002	04/01/2003

- Please identify the types of radioactive waste you expect to generate.

Type	Constituents / Cocktail	Isotope	Activity (mCi)	Amount	Unit of Measure
Dry Solids		3H	5.	25	cubic feet
Liquid (hazardous)	trichloroacetic acid, e	3H	45.	50	Liters
Scintillation vials	biodegradable cocktail	3H, C14	1.	10000	vials
Liquid (water/seawater)		C14	95.	300	Liters
Dry Solids		C15	5.	25	cubic feet

Section 5.0 - Estimate of Hazardous Chemical Waste

It is difficult and expensive to handle hazardous wastes in Antarctica. Please think carefully about chemical needs and minimize the amounts brought to Antarctica.

- Do you expect your proposed project to generate hazardous chemical waste? Yes No

Proper Shipping Name	Quantity	Unit of Measure
radioisotope waste	300	liters
acetone	100	liters
hydrochloroacetic acid (10%)	100	liters
formalin (2%)	100	liters
nutrient analysis reagents	100	liters

If so, note that hazardous chemical wastes are packaged and labeled in the antarctic and sent to the United States for proper disposal. They may not be disposed of in the antarctic station sewer systems. So that the Antarctic Program can make packaging material available, please estimate the major hazardous chemical wastes you expect your proposed project to generate.

Section 6.0 - Cargo

- Do you have cargo requirements?

Yes No

If so, please list all cargo items you expect to ship. If you need further assistance in completing this form, please refer to the help documentation.

Section 6.0 - Cargo

2002 - 2003

Do not use this section for baggage, handcarry items, or for items that the support contractor is purchasing and shipping for you.

❖ Do you have any specific cargo requirements for this season? Yes No

❖ Please describe any general cargo requirements:

Section 6.0 - Cargo

2003 - 2004

Do not use this section for baggage, handcarry items, or for items that the support contractor is purchasing and shipping for you.

❖ Do you have any specific cargo requirements for this season? Yes No

❖ Please describe any general cargo requirements:

Section 6.0 - Cargo

2004 - 2005

Do not use this section for baggage, handcarry items, or for items that the support contractor is purchasing and shipping for you.

❖ Do you have any specific cargo requirements for this season? Yes No

❖ Please describe any general cargo requirements:

Section 6.0 - Cargo

2005 - 2006

Do not use this section for baggage, handcarry items, or for items that the support contractor is purchasing and shipping for you.

❖ Do you have any specific cargo requirements for this season? Yes No

❖ Please describe any general cargo requirements:

Section 6.0 - Cargo

2006 - 2007

Do not use this section for baggage, handcarry items, or for items that the support contractor is purchasing and shipping for you.

❖ Do you have any specific cargo requirements for this season? Yes No

❖ Please describe any general cargo requirements:

Section 6.0 - Cargo

2007 - 2008

Do not use this section for baggage, handcarry items, or for items that the support contractor is purchasing and shipping for you.

❖ Do you have any specific cargo requirements for this season? Yes No

❖ Please describe any general cargo requirements:

Section 7.0 - Construction and Fabrication

- Do you have construction requirements?

Yes No

If so, please specify the needs you anticipate for the antarctic support contractor to build items for your project. If you need further assistance in completing this form, please refer to the help documentation.

Section 7.0 - Construction and Fabrication

2002 - 2003

Specify the types of construction your project requires.

❖ Do you require construction of field camp structures or portable shelters on the sea ice? Yes No

❖ Do you require construction of camp or portable shelters in the remote field? Yes No

❖ Do you require fabrications? Yes No

❖ Include type of fabrication materials.

Small construction jobs to fit platforms on zodiacs, etc. We request that approved researchers be allowed access to Palmer shops to do their own construction without bothering station personnel, when appropriate.

❖ Do you require engineering services? Yes No

❖ Describe items you have specified above and/or discuss construction requirements not covered above. Include any power or fuel requirements.

Send the USAP support contractor any sketches with dimensions and specifications (refer to the Online Help for guidance on sending additional information to the support contractor).

Section 7.0 - Construction and Fabrication

2003 - 2004

Specify the types of construction your project requires.

- ❖ Do you require construction of field camp structures or portable shelters on the sea ice? Yes No
- ❖ Do you require construction of camp or portable shelters in the remote field? Yes No
- ❖ Do you require fabrications? Yes No
- ❖ Do you require engineering services? Yes No
- ❖ Describe items you have specified above and/or discuss construction requirements not covered above. Include any power or fuel requirements.

Send the USAP support contractor any sketches with dimensions and specifications (refer to the Online Help for guidance on sending additional information to the support contractor).

Section 7.0 - Construction and Fabrication

2004 - 2005

Specify the types of construction your project requires.

- ❖ Do you require construction of field camp structures or portable shelters on the sea ice? Yes No
- ❖ Do you require construction of camp or portable shelters in the remote field? Yes No
- ❖ Do you require fabrications? Yes No
- ❖ Do you require engineering services? Yes No
- ❖ Describe items you have specified above and/or discuss construction requirements not covered above. Include any power or fuel requirements.

Send the USAP support contractor any sketches with dimensions and specifications (refer to the Online Help for guidance on sending additional information to the support contractor).

Section 7.0 - Construction and Fabrication

2005 - 2006

Specify the types of construction your project requires.

- ❖ Do you require construction of field camp structures or portable shelters on the sea ice? Yes No
- ❖ Do you require construction of camp or portable shelters in the remote field? Yes No
- ❖ Do you require fabrications? Yes No
- ❖ Do you require engineering services? Yes No
- ❖ Describe items you have specified above and/or discuss construction requirements not covered above. Include any power or fuel requirements.

Send the USAP support contractor any sketches with dimensions and specifications (refer to the Online Help for guidance on sending additional information to the support contractor).

Section 7.0 - Construction and Fabrication

2006 - 2007

Specify the types of construction your project requires.

- ❖ Do you require construction of field camp structures or portable shelters on the sea ice? Yes No
- ❖ Do you require construction of camp or portable shelters in the remote field? Yes No
- ❖ Do you require fabrications? Yes No
- ❖ Do you require engineering services? Yes No
- ❖ Describe items you have specified above and/or discuss construction requirements not covered above. Include any power or fuel requirements.

Send the USAP support contractor any sketches with dimensions and specifications (refer to the Online Help for guidance on sending additional information to the support contractor).

Section 7.0 - Construction and Fabrication

2007 - 2008

Specify the types of construction your project requires.

- ❖ Do you require construction of field camp structures or portable shelters on the sea ice? Yes No
- ❖ Do you require construction of camp or portable shelters in the remote field? Yes No
- ❖ Do you require fabrications? Yes No
- ❖ Do you require engineering services? Yes No
- ❖ Describe items you have specified above and/or discuss construction requirements not covered above. Include any power or fuel requirements.

Send the USAP support contractor any sketches with dimensions and specifications (refer to the Online Help for guidance on sending additional information to the support contractor).

Section 8.0 - Computers and Communication

Computer Support

- Do you plan to bring your own computer or data systems other than those provided by the US Antarctic Program? Yes No

❖ Please explain these systems.

Laptops brought and used by PI's and techs/students

- Do you plan to bring your own software and install it on US Antarctic Program computer systems? Yes No

Connectivity

- Will your project require you to connect a computer to on-site instrumentation, equipment infrastructure, or networks? Yes No

❖ Please describe your connectivity requirements:

Need connections to vessel and Palmer Station LAN's for email, data acquisition and storage.

Communications

- Will your project require the installation of communications equipment (voice, data, or video)? Yes No

- Do you expect your project to require extensive data transmission or voice communications? Yes No

❖ Please describe your communications requirements:

1. Occasional transfer of satellite imagery over internet.

2. one or more 15-30-minute project-related phone calls per week.

3. Phone call time for PI's on station to participate in monthly project conference calls involving all PI's -- especially important if several PI's are on station.

Section 9.0 - Laboratory/Observatory

Laboratory/Observatory Space

Specify the types of laboratory/observatory space your project needs. For further assistance in completing this form, please refer to the Online Help.

- Do you have requirements for laboratory space at McMurdo Station? Yes No
- Do you have requirements for laboratory space at Palmer Station? Yes No
- Do you have requirements for observatory space at South Pole Station? Yes No
- Do you have requirements for laboratory space on the Nathaniel B. Palmer? Yes No
- Do you have requirements for laboratory space on the Laurence M. Gould? Yes No

Equipment and Materials

Major equipment you need that is likely to be useful again in the USAP is usually provided by the antarctic support contractor, not out of your grant. Please refer to the online help (or to the major systems and equipment table for the vessels) for lists of currently available major equipment. This worksheet helps NSF determine the operational budget to support your proposal and to identify items that require a long procurement lead time. Details will be solicited after a grant award is made.

- Do you have requirements for general-purpose science or laboratory equipment that would be provided by the USAP and not your grant? Yes No

Item	Cost
Autonomous profiling vehicles (2/year)	\$60,000.00
Penguin satellite tags (10/year)	\$20,000.00
Penguin VHF tags (30/year)	\$6,000.00
Autonomous nutrient sensors for profilers	\$25,000.00
Ultrafiltration manifold system	\$20,000.00
Total organic carbon analyzer	\$35,000.00
Mooring releases and other hardware (sed trap)	\$.00
Sediment trap mooring & instrumentation	\$.00
Turner Designs Fluorometer	\$8,000.00
BioSonics Digital Acoustic System	\$35,000.00
Plankton imaging Flow-Camera	\$70,000.00
Total:	\$279,000.00

If so, please list equipment if the research station or vessel does not currently have this equipment and if its cost exceeds \$5,000.

- Do you require the use of major systems and equipment on the Nathaniel B. Palmer? Yes No

Section 9.0 - Laboratory/Observatory

- Do you require the use of major systems and equipment on the Laurence M. Gould? Yes No

Specify the amount of Liquid Nitrogen required by your project (in Liters): 100

Specify the amount of Liquid Helium required by your project (in Liters): 0

- Will your project require consumable materials or supplies other than cryogenics, not normally stocked (e.g., chemicals, explosives, etc.)? Yes No

Item	Cost
Lab preservatives and other reagents to be speci	\$.00
Total:	\$.00

- Please discuss any additional laboratory equipment/materials requirements:

Re: major instrumentation purchase:

NB: I am still waiting for information on a few equipment listings provided above (e.g., costs). Also note that some items require continuing purchase over several years. Finally, not all items need to be purchased in the first grant year. They are not listed in priority order.

Top priorities (year 1):

1 profiling system
 BioSonics system
 penguin tags and transmitters
 sediment trap/mooring release
 ultrafiltration unit
 DOC analyzer

Technical Support

Technical support is available to funded researchers in several different areas including marine technicians, science technicians, and analytical chemists.

- If your project requires technical support, please indicate the type of support required and describe the tasks the personnel will perform.
 Routine technical support from RPSC as in previous years aboard LMG for LTER cruises for assistance in hydrographic sampling and scientific lab support, hazardous materials handling and storage, electronics and computer support.

Section 9.0 - Laboratory/Observatory

2002 - 2003

9.2 - Lab Space - Palmer Station

❖ Do you have any specific space requirements for this season?

Yes No

Type of Space	Space Req'd	Unit of Measure	From Date	To Date	Use
Lab 1. General use lab. 38 ft. of bench space, 2 sinks, laminar flow hood. Supports up to 4 people.	38	linear feet	10/15/2002	04/01/2003	Dedicated
Lab 2. General use lab. 15 ft. of bench space, 1 sink. Supports up to 3 people.	75	linear feet	10/15/2002	04/01/2003	Dedicated
Lab 3. General use lab. 15 ft. of bench space, fume hood, 1 sink with fresh seawater. Supports up to 3 people.	15	linear feet	10/15/2002	04/01/2003	Occasional
Lab 4. Isotope lab. Liquid scintillation counter, HPLC, fume hood.	36	linear feet	10/15/2002	04/01/2003	Dedicated
Lab 6.* Instrumental lab, shared use. 2 HPLCs, luminescence spectrometer, 3 spectrophotometers, and balances. Supports up to 3 people.	3	linear feet	10/15/2002	04/01/2003	Occasional
Lab 8.* Microscope lab. Epifluorescence or inverted microscope	3	linear feet	10/15/2002	04/01/2003	Occasional
Lab 9.* Common lab. Autoclave, 2 freeze dryers, dishwasher, microwave oven, and ice maker.	3	linear feet	10/15/2002	04/01/2003	Occasional
Lab 10. General use lab. 25 ft. of bench space, 1 deep sink, fume hood. Supports up to 5 people.	25	linear feet	10/15/2002	04/01/2003	Dedicated
Aquarium room counter space, 25 ft. of bench space, 1 sink	13	linear feet	10/15/2002	04/01/2003	Dedicated
Aquarium tank space	2	tanks	10/15/2002	04/01/2003	Dedicated

❖ Please discuss any additional laboratory space requirements in the space below:

The space requirements specified for the 2002-2003 season are anticipated to remain relatively constant for the ensuing field seasons through 2008.

Lab requirements at Palmer Station are as in preceding years -- i.e., labs for the Smith (BP-032), Fraser (BP-013), Vernet (BP-016) and Ross/Quetin (BP-028) groups with 2 persons per lab throughout each season, in their customary labs. IN ADDITION, Ducklow (BP-045) will also be requiring lab space for a new program in the PAL-LTER. He requests the lab space he used for the 2001-2002 season. The total personnel requirements for each field season at PAL are ten persons.

Also require dive locker use (tanks, weights, compressor, weight harnesses, etc), Oct 15 - Dec 30 each year.

Section 9.0 - Laboratory/Observatory

2003 - 2004

9.2 - Lab Space - Palmer Station

- ❖ Do you have any specific space requirements for this season? Yes No

- ❖ Please discuss any additional laboratory space requirements in the space below:

Section 9.0 - Laboratory/Observatory

2004 - 2005

9.2 - Lab Space - Palmer Station

- ❖ Do you have any specific space requirements for this season? Yes No

- ❖ Please discuss any additional laboratory space requirements in the space below:

Section 9.0 - Laboratory/Observatory

2005 - 2006

9.2 - Lab Space - Palmer Station

- ❖ Do you have any specific space requirements for this season? Yes No

- ❖ Please discuss any additional laboratory space requirements in the space below:

Section 9.0 - Laboratory/Observatory

2006 - 2007

9.2 - Lab Space - Palmer Station

- ❖ Do you have any specific space requirements for this season? Yes No

- ❖ Please discuss any additional laboratory space requirements in the space below:

Section 9.0 - Laboratory/Observatory

2007 - 2008

9.2 - Lab Space - Palmer Station

- ❖ Do you have any specific space requirements for this season? Yes No

- ❖ Please discuss any additional laboratory space requirements in the space below:

Section 9.0 - Laboratory/Observatory

2002 - 2003

9.5 - Lab Space - Laurence M. Gould

- ❖ Do you have any specific space requirements for this season? Yes No
- ❖ Do you plan to bring equipment on board that will require mounting space in the vessel laboratory? Yes No
- ❖ Please discuss any additional laboratory space requirements in the space below:

PAL-LTER requires dedicated use of the LMG for 28 days (Palmer Station to Palmer Station) each January 2003 -- 2008. Needs are identical to previous LTER cruises.

Section 9.0 - Laboratory/Observatory

2003 - 2004

9.5 - Lab Space - Laurence M. Gould

- ❖ Do you have any specific space requirements for this season? Yes No
- ❖ Do you plan to bring equipment on board that will require mounting space in the vessel laboratory? Yes No
- ❖ Please discuss any additional laboratory space requirements in the space below:

Section 9.0 - Laboratory/Observatory

2004 - 2005

9.5 - Lab Space - Laurence M. Gould

- ❖ Do you have any specific space requirements for this season? Yes No
- ❖ Do you plan to bring equipment on board that will require mounting space in the vessel laboratory? Yes No
- ❖ Please discuss any additional laboratory space requirements in the space below:

Section 9.0 - Laboratory/Observatory

2005 - 2006

9.5 - Lab Space - Laurence M. Gould

- ❖ Do you have any specific space requirements for this season? Yes No

- ❖ Do you plan to bring equipment on board that will require mounting space in the vessel laboratory? Yes No

- ❖ Please discuss any additional laboratory space requirements in the space below:

Section 9.0 - Laboratory/Observatory

2006 - 2007

9.5 - Lab Space - Laurence M. Gould

- ❖ Do you have any specific space requirements for this season? Yes No

- ❖ Do you plan to bring equipment on board that will require mounting space in the vessel laboratory? Yes No

- ❖ Please discuss any additional laboratory space requirements in the space below:

Section 9.0 - Laboratory/Observatory

2007 - 2008

9.5 - Lab Space - Laurence M. Gould

- ❖ Do you have any specific space requirements for this season? Yes No
- ❖ Do you plan to bring equipment on board that will require mounting space in the vessel laboratory? Yes No
- ❖ Please discuss any additional laboratory space requirements in the space below:

Section 9.0 - Laboratory/Observatory

2002 - 2003

9.7 - Equipment - Laurence M. Gould

❖ Do you have any requirements for major systems and equipment for this season?

Yes No

Item
Acoustic Doppler Current Profiler (ADCP), RDI 150 kHz Narrow-Band
Aquaria (8 at 24 cu. ft.)
Bottles, 10 and 12 liter Go-Flo, 30 liter Niskin, General Oceanics
CTD System, Sea Bird 911Plus (maximum depth: 6800m)
Fluorometer, digital, Turner Designs model 10AU-005, installed in-line for underway measurements
Incubator, Deck
MOCNESS, 1 and 10 meter, with pinger and accessories
Net, Plankton, 1 m ring
PDR for pinger tracking, Raytheon 12 kHz
QFAX APT system infrared and visual imagery from polar orbiting NOAA satellites
Radiometer system, PUV/GUV, Biospherical Instruments
Sonar, Knudsen 320B/R, 8300 watts maximum, 12 kHz mode
Thermal Graphics Recorder, EPC model 1086, for pinger plotting
Thermosalinograph, SBE 21 with remote temperature sensor
Time Depth Recorder (TDR) for nets or trawls, 500 and 2500 meter
Transmissometer, WETLabs, installed in-line, analog data signal (voltage is included in data string for the TSG)
Winch, DUSH 4 hydrographic winch, Aft 01 Deck, with 6000m 1/4" hydrowire and .322 EM cable, 6000m
Winch, DUSH 5 hydrographic winch, Baltic Room, with 10,000m 0.322 3-conductor EMC wire
XBT Sippican MK 12 (use with XBT, XCTD, XSVTD)

❖ Please discuss any additional major systems and equipment requirements:

The requirements specified above for January 2003 will remain about the same for each season, January 2003 - 2008.

Two radioisotope vans are required on LMG for each cruise.

Section 9.0 - Laboratory/Observatory

2003 - 2004

9.7 - Equipment - Laurence M. Gould

- ❖ Do you have any requirements for major systems and equipment for this season? Yes No

- ❖ Please discuss any additional major systems and equipment requirements:

Section 9.0 - Laboratory/Observatory

2004 - 2005

9.7 - Equipment - Laurence M. Gould

- ❖ Do you have any requirements for major systems and equipment for this season? Yes No

- ❖ Please discuss any additional major systems and equipment requirements:

Section 9.0 - Laboratory/Observatory

2005 - 2006

9.7 - Equipment - Laurence M. Gould

- ❖ Do you have any requirements for major systems and equipment for this season? Yes No

- ❖ Please discuss any additional major systems and equipment requirements:

Section 9.0 - Laboratory/Observatory

2006 - 2007

9.7 - Equipment - Laurence M. Gould

- ❖ Do you have any requirements for major systems and equipment for this season? Yes No

- ❖ Please discuss any additional major systems and equipment requirements:

Section 9.0 - Laboratory/Observatory

2007 - 2008

9.7 - Equipment - Laurence M. Gould

- ❖ Do you have any requirements for major systems and equipment for this season? Yes No

- ❖ Please discuss any additional major systems and equipment requirements:

Section 10.0 - Aircraft Support

- Do you have any requirements for fixed-wing aircraft support? Yes No
- Do you have any requirements for helicopter support? Yes No

Section 11.0 - Vehicle/Field Power/Boating Support

Stations

- Do you have Vehicle or Field Electrical Power requirements for McMurdo Station? Yes No
- Do you have vehicle requirements for Palmer Station? Yes No
- Do you have vehicle requirements for South Pole Station? Yes No

Vessels

- Does your project require Zodiac or snowmobile support? Yes No

Section 11.0 - Vehicle/Field Power/Boating Support

2002 - 2003

11.3 - Palmer Station

❖ Do you have specific vehicle requirements?

Yes No

Vehicle	Quantity	From Date	To Date	Use
Zodiac - MKIII, 15 ft.	1	10/15/0200	04/01/2003	Dedicated
Zodiac - MKV, 19 ft.	3	10/15/2002	04/01/2003	Dedicated

❖ Additional requirements or comments:

Zodiac requirements specified above for the 2002-2003 season will remain relatively constsant over the next 6 years, 2002-2008.

Section 11.0 - Vehicle/Field Power/Boating Support

2003 - 2004

11.3 - Palmer Station

❖ Do you have specific vehicle requirements?

Yes No

❖ Additional requirements or comments:

Section 11.0 - Vehicle/Field Power/Boating Support

2004 - 2005

11.3 - Palmer Station

❖ Do you have specific vehicle requirements?

Yes No

❖ Additional requirements or comments:

Section 11.0 - Vehicle/Field Power/Boating Support

2005 - 2006

11.3 - Palmer Station

❖ Do you have specific vehicle requirements?

Yes No

❖ Additional requirements or comments:

Section 11.0 - Vehicle/Field Power/Boating Support

2006 - 2007

11.3 - Palmer Station

❖ Do you have specific vehicle requirements?

Yes No

❖ Additional requirements or comments:

Section 11.0 - Vehicle/Field Power/Boating Support

2007 - 2008

11.3 - Palmer Station

❖ Do you have specific vehicle requirements?

Yes No

❖ Additional requirements or comments:

Section 11.0 - Vehicle/Field Power/Boating Support

2002 - 2003

11.5 - Vessels

❖ Please describe your required Zodiac and snowmobile support below:

Zodiac support for routine water sampling and land access in the Arthur Harbor/Palmer Station vicinity including outlying islands. Four (4) dedicated Zodiacs required for the Smith/Vernet (032-016), Ross/Quetin (028), Fraser (013) and Ducklow (045) groups each season at Palmer Station.

Possible Zodiac support from the LMG during January cruises for ice sampling also required.

Section 11.0 - Vehicle/Field Power/Boating Support

2003 - 2004

11.5 - Vessels

- ❖ Please describe your required Zodiac and snowmobile support below:

Section 11.0 - Vehicle/Field Power/Boating Support

2004 - 2005

11.5 - Vessels

- ❖ Please describe your required Zodiac and snowmobile support below:

Section 11.0 - Vehicle/Field Power/Boating Support

2005 - 2006

11.5 - Vessels

- ❖ Please describe your required Zodiac and snowmobile support below:

Section 11.0 - Vehicle/Field Power/Boating Support

2006 - 2007

11.5 - Vessels

- ❖ Please describe your required Zodiac and snowmobile support below:

Section 11.0 - Vehicle/Field Power/Boating Support

2007 - 2008

11.5 - Vessels

- ❖ Please describe your required Zodiac and snowmobile support below:

Section 12.0 - Global Positioning Support

- Do you have any requirements for Global Positioning support?

Yes No

Section 12.0 - Global Positioning Support

2002 - 2003

Please enter your requirements for Global Positioning support.

- ❖ Approximate start date of GPS support: 11/01/2002
- ❖ Approximate end date of GPS support: 04/01/2003
- ❖ Do you have experience with geodetic surveys? Yes No
- ❖ Is GPS support detailed in your proposal? Yes No

Range of Accuracy

Check one of the following to identify the accuracy you require from GPS:

- ❖ Sub-centimeter (continuous stations, static surveys, several 8+ hour occupations, advanced processing techniques)? Yes No
- ❖ 1-10 cm (static/rapid static/kinematic surveys)? Yes No
- ❖ 1-5 meters (differential code or single receiver point positioning)? Yes No
- ❖ 5-10 meters (navigation or rough positioning with handheld receiver)? Yes No

Specific Requirements

Check the requirement(s) that apply to your project

- ❖ Real-time (RTK) GPS equipment? (Real-time GPS provides precision at the centimeter-to-meter level in real-time with no post-processing requirements.) Yes No
- ❖ Long term (1-13 months) data collection. Yes No
- ❖ GIS mapping. Yes No
- ❖ Training in operating the GPS equipment (Trimble 4000/4700/5700): Yes No
- ❖ Assistance in getting started with your GPS surveying in the field? Yes No
- ❖ Processing assistance? (Trimble GPSurvey and Total Control software is available.) Yes No

Section 12.0 - Global Positioning Support

2002 - 2003

❖ Describe any special requirements for your GPS support:

Routine GPS aboard LMG on January cruises and handheld GPS in field at Palmer Station.

Needs specified for 2002-2003 season will remain relatively constant for 2002-2008 seasons.

Section 12.0 - Global Positioning Support

2003 - 2004

Please enter your requirements for Global Positioning support.

- ❖ Approximate start date of GPS support:
- ❖ Approximate end date of GPS support:
- ❖ Do you have experience with geodetic surveys? Yes No
- ❖ Is GPS support detailed in your proposal? Yes No

Range of Accuracy

Check one of the following to identify the accuracy you require from GPS:

- ❖ Sub-centimeter (continuous stations, static surveys, several 8+ hour occupations, advanced processing techniques)? Yes No
- ❖ 1-10 cm (static/rapid static/kinematic surveys)? Yes No
- ❖ 1-5 meters (differential code or single receiver point positioning)? Yes No
- ❖ 5-10 meters (navigation or rough positioning with handheld receiver)? Yes No

Specific Requirements

Check the requirement(s) that apply to your project

- ❖ Real-time (RTK) GPS equipment? (Real-time GPS provides precision at the centimeter-to-meter level in real-time with no post-processing requirements.) Yes No
- ❖ Long term (1-13 months) data collection. Yes No
- ❖ GIS mapping. Yes No
- ❖ Training in operating the GPS equipment (Trimble 4000/4700/5700): Yes No
- ❖ Assistance in getting started with your GPS surveying in the field? Yes No
- ❖ Processing assistance? (Trimble GPSurvey and Total Control software is available.) Yes No
- ❖ Describe any special requirements for your GPS support:

Section 12.0 - Global Positioning Support

2004 - 2005

Please enter your requirements for Global Positioning support.

- ❖ Approximate start date of GPS support:
- ❖ Approximate end date of GPS support:
- ❖ Do you have experience with geodetic surveys? Yes No
- ❖ Is GPS support detailed in your proposal? Yes No

Range of Accuracy

Check one of the following to identify the accuracy you require from GPS:

- ❖ Sub-centimeter (continuous stations, static surveys, several 8+ hour occupations, advanced processing techniques)? Yes No
- ❖ 1-10 cm (static/rapid static/kinematic surveys)? Yes No
- ❖ 1-5 meters (differential code or single receiver point positioning)? Yes No
- ❖ 5-10 meters (navigation or rough positioning with handheld receiver)? Yes No

Specific Requirements

Check the requirement(s) that apply to your project

- ❖ Real-time (RTK) GPS equipment? (Real-time GPS provides precision at the centimeter-to-meter level in real-time with no post-processing requirements.) Yes No
- ❖ Long term (1-13 months) data collection. Yes No
- ❖ GIS mapping. Yes No
- ❖ Training in operating the GPS equipment (Trimble 4000/4700/5700): Yes No
- ❖ Assistance in getting started with your GPS surveying in the field? Yes No
- ❖ Processing assistance? (Trimble GPSurvey and Total Control software is available.) Yes No
- ❖ Describe any special requirements for your GPS support:

Section 12.0 - Global Positioning Support

2005 - 2006

Please enter your requirements for Global Positioning support.

- ❖ Approximate start date of GPS support:
- ❖ Approximate end date of GPS support:
- ❖ Do you have experience with geodetic surveys? Yes No
- ❖ Is GPS support detailed in your proposal? Yes No

Range of Accuracy

Check one of the following to identify the accuracy you require from GPS:

- ❖ Sub-centimeter (continuous stations, static surveys, several 8+ hour occupations, advanced processing techniques)? Yes No
- ❖ 1-10 cm (static/rapid static/kinematic surveys)? Yes No
- ❖ 1-5 meters (differential code or single receiver point positioning)? Yes No
- ❖ 5-10 meters (navigation or rough positioning with handheld receiver)? Yes No

Specific Requirements

Check the requirement(s) that apply to your project

- ❖ Real-time (RTK) GPS equipment? (Real-time GPS provides precision at the centimeter-to-meter level in real-time with no post-processing requirements.) Yes No
- ❖ Long term (1-13 months) data collection. Yes No
- ❖ GIS mapping. Yes No
- ❖ Training in operating the GPS equipment (Trimble 4000/4700/5700): Yes No
- ❖ Assistance in getting started with your GPS surveying in the field? Yes No
- ❖ Processing assistance? (Trimble GPSurvey and Total Control software is available.) Yes No
- ❖ Describe any special requirements for your GPS support:

Section 12.0 - Global Positioning Support

2006 - 2007

Please enter your requirements for Global Positioning support.

- ❖ Approximate start date of GPS support:
- ❖ Approximate end date of GPS support:
- ❖ Do you have experience with geodetic surveys? Yes No
- ❖ Is GPS support detailed in your proposal? Yes No

Range of Accuracy

Check one of the following to identify the accuracy you require from GPS:

- ❖ Sub-centimeter (continuous stations, static surveys, several 8+ hour occupations, advanced processing techniques)? Yes No
- ❖ 1-10 cm (static/rapid static/kinematic surveys)? Yes No
- ❖ 1-5 meters (differential code or single receiver point positioning)? Yes No
- ❖ 5-10 meters (navigation or rough positioning with handheld receiver)? Yes No

Specific Requirements

Check the requirement(s) that apply to your project

- ❖ Real-time (RTK) GPS equipment? (Real-time GPS provides precision at the centimeter-to-meter level in real-time with no post-processing requirements.) Yes No
- ❖ Long term (1-13 months) data collection. Yes No
- ❖ GIS mapping. Yes No
- ❖ Training in operating the GPS equipment (Trimble 4000/4700/5700): Yes No
- ❖ Assistance in getting started with your GPS surveying in the field? Yes No
- ❖ Processing assistance? (Trimble GPSurvey and Total Control software is available.) Yes No
- ❖ Describe any special requirements for your GPS support:

Section 12.0 - Global Positioning Support

2007 - 2008

Please enter your requirements for Global Positioning support.

- ❖ Approximate start date of GPS support:
- ❖ Approximate end date of GPS support:
- ❖ Do you have experience with geodetic surveys? Yes No
- ❖ Is GPS support detailed in your proposal? Yes No

Range of Accuracy

Check one of the following to identify the accuracy you require from GPS:

- ❖ Sub-centimeter (continuous stations, static surveys, several 8+ hour occupations, advanced processing techniques)? Yes No
- ❖ 1-10 cm (static/rapid static/kinematic surveys)? Yes No
- ❖ 1-5 meters (differential code or single receiver point positioning)? Yes No
- ❖ 5-10 meters (navigation or rough positioning with handheld receiver)? Yes No

Specific Requirements

Check the requirement(s) that apply to your project

- ❖ Real-time (RTK) GPS equipment? (Real-time GPS provides precision at the centimeter-to-meter level in real-time with no post-processing requirements.) Yes No
- ❖ Long term (1-13 months) data collection. Yes No
- ❖ GIS mapping. Yes No
- ❖ Training in operating the GPS equipment (Trimble 4000/4700/5700): Yes No
- ❖ Assistance in getting started with your GPS surveying in the field? Yes No
- ❖ Processing assistance? (Trimble GPSurvey and Total Control software is available.) Yes No
- ❖ Describe any special requirements for your GPS support: