REPORT OF GRADUATE COUNCIL  
October 7, 2004

The Graduate Council approved the College of Geosciences Department of Oceanography Nonsubstantive Degree Program Proposal for a Master of Geosciences – Track in Ocean Observing Systems.
September 29, 2004

MEMORANDUM

TO:                   John R. Giardino 
                      Dean of Graduate Studies

FROM:                 Vatche P. Tchakerian 
                      Interim Associate Dean for Academic Affairs

SUBJECT: Proposal for a Track in Ocean Observing Systems in the Master of Geosciences

Attached is a proposal from the Department of Oceanography for a track in Ocean Observing Systems to be added as an option to the existing Master of Geosciences program. The Geosciences Graduate Instruction and Curriculum Committee approved this proposal at its September 27, 2004 meeting. Please add this proposal to the agenda for the October 2004 Graduate Council meeting. Questions concerning this proposal should be directed to Lisa Campbell in the Department of Oceanography at 845-5706 or lcampbell@ocean.tamu.edu.

xc: Wilf Gardner, Head, Department of Oceanography
    Lisa Campbell, Oceanography Department GGICCC Representative
Nonsubstantive Degree Program Proposal
Title Page

NAME OF INSTITUTION Texas A&M University

NAME OF PROPOSED PROGRAM Master of Geosciences--Track in Ocean Observing Systems

Display how proposed program(s) would appear on the Coordinating Board program inventory; include Texas CIP code designation(s).

How would name(s) of program(s) appear on student diplomas?
Master of Geosciences

How would name(s) of program(s) appear on student transcripts?
M.S. Gsc., Ocn. Obs.

Administrative unit(s) responsible for the program(s):
Department of Oceanography

Proposed date for implementation of program: Fall 2005

Person to be contacted for further information about proposed program(s):
Name: Wilf Gardner Title: Professor and Head
Phone: (979) 845-7211 FAX: (979) 845-6331

Signatures:

Campus Chief Executive Officer Date

System Chief Executive Officer Date
(As appropriate)

Governing Board approval date:
The Texas Higher Education Coordinating Board
Universities Division

Nonsubstantive Request for Degree Program

I. Reason for Request

A. Rationale

Ocean Observing Systems are an important new direction in oceanographic research for assessment of environmental health and climate change. Texas A&M University’s commitment to Ocean Observing Systems is demonstrated, as it is one of three Signature Program Areas targeted by the College of Geosciences and identified as a major thrust area of the Department of Oceanography. Further, two new Faculty Reinvestment hires in the Department of Oceanography are specifically identified with Ocean Observing Systems; the first has been hired in FY04, the second is scheduled for hire in FY05. It is envisioned that the U.S. Integrated Ocean Observing System, IOOS, will be akin to the National Weather Service and will be designed to provide real-time oceanographic data, services, and products (http://www.ocean.us). It is significant that the President’s Commission on Ocean Policy has recommended the immediate implementation of IOOS. Successful implementation of this system will require specially trained individuals in ocean data collection, data management, and production and distribution of needed products and services Other major oceanographic institutions, such as Rutgers University, have already established a Master’s Degree in Operational Oceanography (http://marine.rutgers.edu/cool/moo/index.html). Current operators of ocean observing systems have indicated a willingness to consider for employment individuals with Ocean Observing training (see supporting documents).

A new track in Ocean Observing Systems is proposed for the existing Masters degree program in Geosciences to meet the demand for such individuals. The College of Geosciences is unique in the range subject matter in which training is available, such as, in situ ocean observations, remote sensing technologies (RS), data analysis and display, including geographic information systems (GIS), analytical techniques and modeling, and an existing ocean observing system element, the Texas Automated Buoy System. The proposed TAMU graduate program in Ocean Observing Systems (M. Gsc.- Ocn. Obs.) is designed to meet the growing demands for trained persons and will take advantage of the complementary resources in the College of Geosciences, namely the TAMU certificate programs in GIS and RS. The Track in Ocean Observing Systems program targets current non-thesis graduate students in the Geosciences MS program, as well as other programs who would like to add an Ocean Observing credential to their portfolio as a means of enhancing their professional prospects.

B. Supporting Documents

Letters of support from environmental managers and related departments are attached.

Dr. Bruce Michaels (State of Maryland)       Michael Longnecker (Department Head, Statistics)
Dr. James Simmonds (State of Washington)    Albert Bogges (Department Head, Mathematics)
Dr. Billy Edge (Ocean Engineering)           Richard Orville (Department Head, Atmospheric Sciences)
Dr. R. Buzz Martin (TX General Land Office)  Dr. C.T. Smith (Department Head, Forest Science)
Douglas Sherman (Department Head, Geography)
II. Program Description

A. Educational objectives, degree requirements, and curriculum requirement

The educational objectives of this program are to train a new generation of oceanographic professionals with the skills necessary to operate multi-disciplinary ocean observing system elements for monitoring the oceans and to use such observations to create and disseminate reliable assessments and predictions of the state of the oceans.

The MS Geosciences-track in Ocean Observing Systems program will provide a fundamental understanding of oceanography and the technical training required for expertise in data analysis. The two-year program will consist of nine foundation courses and three elective courses. The program is designed to be completed in two years, although no time constraints are imposed. Transcripts designating a “Track in Ocean Observing Systems” will be awarded to students who complete a schedule of course work (see Table 1) and meet the requirements for the Masters degree in Geosciences.

Table 1. Requirements for MS Gsc.-Ocn. Obs.

*Introductory Level (required):*
OCNG 604 - Ocean Observing Systems (3)
OCNG 608 - Physical Oceanography (3)
OCNG 620 - Biological Oceanography (3)
OCNG 640 - Chemical Oceanography (3)
OCNG 657 - Data Methods and Graphical Representation in Oceanography (3)
GEOG 651 - Remote Sensing for Geographical Analysis (3)
ATMO 629 - Climate Change (3)
FRSC 651 - Geographic Information Systems (3)
STAT 601 – Statistical Analysis (4)

*Electives selected from the following (1 of the following):*
GEOG 660 - GIS-Based Spatial Analysis and Modeling (3)
GEOG 661 - Digital Image Processing and Analysis (3)
GEOG 665 - GIS-based Spatial Analysis and Modeling (3)
ATMO 656 - Tropical Meteorology (3)

*Electives selected from the following (2 of the following):*
OCNG 610 - Mathematical Modeling of Marine Ecosystems (3)
OCNG 649 - Estuarine Biogeochemistry (3)
FRSC 608 - Remote Sensing for Wildland Resource Management (3)
FRSC 661 - Advanced Remote Sensing (3)
FRSC 652 - Advanced Topics in Geographic Information Systems (3)
MATH 601 - Methods of Applied Mathematics (3)
STAT 626 - Methods in Time Series Analysis (3)

III. Relationship to Existing Authorized Programs

A. Relationship Between Existing and Proposed Programs
The existing non-thesis Master of Geosciences degree provides the structure and support for this Program. All required courses and choice of electives are structured so that the proposed program will meet requirements of the M.S. Gsc. degree. The proposed Program defines which existing graduate courses must be completed to provide the student with sufficient training. Thus the Track in Ocean Observing Systems program will provide a more focused program than is allowed in the traditional Master of Geosciences degree.

B. Effect of Proposed Program on existing programs
The effect on enrollment will be to augment existing class size, which in some cases will permit classes to be taught more frequently than is currently possible due to limited number of graduate students in oceanography. There will be no need for additional sections of existing courses, though enrollment in current sections may increase slightly.

There will be no need for any additional new faculty beyond those hires currently planned in the next four years, and no additional library resources will be required.

IV. Expected Enrollment
The estimated head count and FTE is expected to be around 45 for the next five years (Table 2).

<table>
<thead>
<tr>
<th>Year</th>
<th>New Students</th>
<th>Enrolled Students</th>
<th>Graduated Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>5</td>
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<tr>
<td>Year 2</td>
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<td>Year 3</td>
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<tr>
<td>Year 5</td>
<td>15</td>
<td>35</td>
<td>10</td>
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</table>

The projected enrollment estimate is based on similar assumptions for the MS Geosciences degree program.

V. Resources

A. Courses implemented and needed
Required and elective courses for this program are all courses that are existing, implemented courses (Table 1). Three courses are new or newly revised (Table 3) or have been implemented within the past three years (Table 4). One of the required courses has been revised from an existing course to better address the objectives of this Program in Ocean Observing Systems (OCNG 604) (Table 4).

Table 3. New or Newly Revised Courses
<table>
<thead>
<tr>
<th>Faculty</th>
<th>Title</th>
<th>Instructor</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCNG 657</td>
<td>Data Methods and Graphical Representation in Oceanography (new)</td>
<td>S. DiMarco</td>
<td>3</td>
</tr>
<tr>
<td>OCNG 604</td>
<td>Ocean Observing Systems (revised)</td>
<td>S. DiMarco</td>
<td>3</td>
</tr>
</tbody>
</table>
Table 4. Courses Implemented within the Past 3 Years

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Title</th>
<th>Instructor</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 651</td>
<td>Remote Sensing for Geographical Analysis</td>
<td>A. Filippi</td>
<td>3</td>
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</tbody>
</table>

B. Faculty Resources.

No new faculty are required. Existing faculty resources are listed in Table 5.

Table 5. Existing Faculty Resources

<table>
<thead>
<tr>
<th>Faculty</th>
<th>Degree/Institution/Field of Study/Date</th>
<th>Current Assignments</th>
<th>Contribution to the Program</th>
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<tbody>
<tr>
<td><strong>Oceanography</strong></td>
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<tr>
<td>D. Biggs</td>
<td>PhD., Woods Hole Oceanographic Institution, Massachusetts Institute of Technology, Oceanography, 1976 B.A. with Honors, Franklin &amp; Marshall College, Biology, 1972</td>
<td>Professor, Biological Section</td>
<td>OCNG 401 OCNG 620 OCNG 602</td>
</tr>
<tr>
<td>S. Di Marco</td>
<td>PhD., University of Texas at Dallas, Physics, 1991 M. S., University of Texas at Dallas, Physics, 1988 B. S. University of Dallas, Physics, 1985</td>
<td>Associate Professor, Physical Section</td>
<td>OCNG 604 OCNG 657 OCNG 689</td>
</tr>
<tr>
<td>G. Jackson</td>
<td>PhD., California Institute of Technology, Environmental Engineering Science and Biology, 1976 M.S., California Institute of Technology, Environmental Engineering Science and Biology, 1970 B. S., California Institute of Technology, Physics, 1969</td>
<td>Professor, Physical and Biological Sections</td>
<td>OCNG 620 OCNG 610</td>
</tr>
<tr>
<td>J. Morse</td>
<td>PhD., Yale University, Geology, 1973 M.S., Yale University, Geology, 1971 B.S., Institute of Technology, University of Minnesota, 1969</td>
<td>Louis and Elizabeth Scherck Professor of Oceanography, Chemical Section</td>
<td>OCNG 641 OCNG 640 OCNG 649</td>
</tr>
<tr>
<td>R. Stewart</td>
<td>PhD., University of California, San Diego, Oceanography, 1969 B. S., University of Texas, Arlington, Physics, 1963</td>
<td>Professor, Physical Section</td>
<td>OCNG 608 OCNG 401 GEOS 105 OCNG 410</td>
</tr>
<tr>
<td>A. Stössel</td>
<td>PhD., University of Hamburg, Germany, Physical Oceanography, 1990 M.S., University of Hamburg, Germany, Physical Oceanography, 1985 B.S., University of Kiel, Germany, Physical Oceanography, 1977</td>
<td>Associate Professor, Physical Section</td>
<td>OCNG 608 OCNG 410 OCNG 615 OCNG 614</td>
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### Atmospheric Sciences

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<tr>
<th>Name</th>
<th>Education Details</th>
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<tbody>
<tr>
<td>G. North</td>
<td>PhD., University of Wisconsin, 1966</td>
<td>Distinguished Professor and Holder</td>
<td>ATMO 629</td>
</tr>
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<td></td>
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<td>of the Harold J. Haynes Endowed</td>
<td>ATMO 335</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Chair in Geosciences</td>
<td>ATMO 631</td>
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<tr>
<td></td>
<td></td>
<td>Professor</td>
<td>ATMO 659</td>
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<tr>
<td>J. Nielsen-Gammon</td>
<td>PhD., Massachusetts Institute of Technology, Meteorology, 1990</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>S.M., Massachusetts Institute of Technology, Meteorology, 1987</td>
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<tr>
<td></td>
<td>S.B., Massachusetts Institute of Technology, Earth and Planetary Sciences, 1984</td>
<td></td>
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<tr>
<td>C. Schumacher</td>
<td>Ph.D., Atmospheric Sciences, University of Washington, 2003</td>
<td>Assistant Professor</td>
<td>ATMO 656</td>
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<td></td>
<td>M.S., Atmospheric Sciences, University of Washington, 2000</td>
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<td></td>
<td>B.A., Environmental Sciences, University of Virginia, 1994</td>
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### Geography

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<th>Name</th>
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<tr>
<td>A. Filippi</td>
<td>PhD. University of South Carolina, Geography, 2003</td>
<td>Assistant Professor</td>
<td>GEOG 203</td>
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<tr>
<td></td>
<td>M.S., University of South Carolina, Geography, 1998</td>
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<td>GEOG 361</td>
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<td>B.S., Kansas State University, Geography, 1995</td>
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<td>GEOG 475</td>
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<td></td>
<td>B.A., Macalester College, Geology, Geography and Environmental Studies, 1990</td>
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<td></td>
<td>B.S., Kansas State University, Geography, 1995</td>
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<tr>
<td>A. Klein</td>
<td>PhD., Cornell University, Geological Sciences, 1997</td>
<td>Associate Professor</td>
<td>BUSH 689</td>
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<td></td>
<td>B.A. Macalester College, Geology, Geography and Environmental Studies, 1990</td>
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<td></td>
<td>B.A. Macalester College, Geology, Geography and Environmental Studies, 1990</td>
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<td></td>
<td>B.A. Macalester College, Geology, Geography and Environmental Studies, 1990</td>
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### Forest Science

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<tr>
<td>S. Popescu</td>
<td>PhD., Virginia Tech, Forestry, 2002</td>
<td>Assistant Professor</td>
<td>FRSC 398</td>
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<td>Diploma Degree, Transylvania</td>
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<td></td>
<td>University of Brasov, Romania, Forest Engineer, 1992</td>
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<td>FRSC 608</td>
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<td>M.S., Asian Institute of Technology (Bangkok), Agricultural Engineering, 1989</td>
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<tr>
<td>R. Srinivasan</td>
<td>PhD., Agricultural Engineering, Purdue University, 1992</td>
<td>Professor</td>
<td>FRSC 652</td>
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<td></td>
<td>M.S., Asian Institute of Technology (Bangkok), Agricultural Engineering, 1989</td>
<td></td>
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<td></td>
<td>B.E., TNAU (India) Agricultural Engineering, 1984</td>
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<tr>
<td>Mathematics</td>
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<tr>
<td>C. Pearcy</td>
<td>PhD., Rice University, 1959</td>
<td>Professor of Mathematics,</td>
<td>MATH 601</td>
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<td>M.S., Texas A&amp;M University, 1956</td>
<td>TAMU</td>
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<td></td>
<td>B.A., Texas A&amp;M University, 1954</td>
<td>Professor Emeritus,</td>
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<td>University of Michigan</td>
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<td></td>
<td></td>
<td>Professor</td>
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<tr>
<td>G. Chen</td>
<td>PhD., University Wisconsin, 1977</td>
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<td>B.S. National Tsing-Hua University, 1972</td>
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<td>Statistics</td>
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<tr>
<td>H. Joseph</td>
<td>PhD., SUNY/Buffalo, Statistical Sciences, 1975</td>
<td>Dean of Science</td>
<td>STAT 626</td>
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<td>Newton</td>
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<td>M.S., SUNY/Buffalo, Statistics, 1973</td>
<td>Professor of Statistics</td>
<td>STAT 604</td>
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<td>B.S., Niagara University, Mathematics, 1971</td>
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<tr>
<td>T. Hsing</td>
<td>Ph.D., University of North Carolina, Statistics, 1984</td>
<td>Professor</td>
<td>STAT 211</td>
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<td>T. Wehrly</td>
<td>PhD., University of Wisconsin-Madison, Statistics, 1976</td>
<td>Professor</td>
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<td>B.S. University of Michigan-Ann Arbor, Mathematics, 1969</td>
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<td>MATH 669</td>
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<tr>
<td>J. Lim</td>
<td>PhD., Stanford University, Statistics, 2003</td>
<td>Assistant Professor</td>
<td>STAT 211</td>
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<td>M.S., Seoul National University, Seoul, Korea, Statistics, 1998</td>
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<td>B.S., Seoul National University, Seoul, Korea, Statistics, 1995</td>
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</tbody>
</table>

C. Equipment

No equipment is required to implement this program

D. Facilities

No new facilities are required to implement this non-substantive change.

E. Library

No new library resources are needed
Dr. Wilf Gardner  
Department of Oceanography  
3146 Texas A&M University  
College Station, TX 77843  

July 6, 2004  

Dear Dr. Gardner,

I am writing to you in support of the proposed Ocean Observing graduate program at Texas A&M. I was informed of the program by your colleague, Dr. Lisa Campbell, at a recent Alliance for Coastal Technologies workshop in Honolulu, HI.

As Director of the Maryland Department of Natural Resources Tidewater Ecosystem Assessment Division (DNR/TEA), I am responsible for oversight of Maryland’s Chesapeake Bay Monitoring and Analysis Program. In recent years, we have expanded our fixed station water quality and habitat monitoring program to include temporally continuous and spatially intensive monitoring programs. Currently our program operates 34 continuous real-time and near-time monitors and conducts water quality mapping in 13 Maryland tributaries (information on our programs can be found at www.EyesontheBay.net). These new technologies accounted for over 9 million individual data records in 2003. Such programs require staff that have training in not only biology, chemistry or resource management, but also skills such as computer programming, database management, geographic information systems, remote sensing and the ability to assimilate large and diverse datasets. In my experience, staff with a scientific background who then acquire these skill sets tend to be better suited to a career in monitoring and assessment than those with solely a computer-related background.

The development of new monitoring technologies and the increased need for monitoring of aquatic environments will dictate a higher demand for employees with technical and quantitative skills in the marine sciences. Creating an interdisciplinary program such as this would greatly benefit students and well as employers. During recent employee searches, we have found there to be a paucity of qualified applicants, but a program tailored to new ocean and estuarine monitoring technologies would help meet the personnel demand in this emerging area of research and management. I therefore strongly recommend the development of a graduate level program to provide the necessary training and skills required in the field of “Ocean Observing” and as a State Agency, we would be looking for qualified students who have completed the program to fill employment opportunities in our program.

Sincerely,

Bruce Michael, Director,  
Tidewater Ecosystem Assessment  
Maryland Department of Natural Resources
July 22, 2004

Dr. Wilf Gardner
Dept. Oceanography
3146 Texas A&M University
College Station, TX 77843

RE: Letter of support for proposed program in Ocean Observing

Dear Dr. Gardner:

I wanted to take this opportunity to express my support for Dr. Lisa Campbell’s proposed program in Ocean Observing. Dr. Campbell and I met at a workshop in Hawaii regarding optical particle counters, and her description of her proposed program immediately caught my interest. It is my belief that there is a growing need for such trained individuals, as the number of remote continuous monitoring platforms increases around the country, and indeed the world.

I supervise about 30 water quality scientists for King County’s Department of Natural Resources, with extensive monitoring programs in Puget Sound, large lakes, rivers, streams, and groundwater systems. I have found over the years that some of the most valuable personnel are those that have a combination of scientific, data management, and computer programming skills. It is my observation that as our monitoring programs have evolved towards the collection of multiple large, essentially continuous data sets that require specialized data management skills, we have had difficulty finding staff with the appropriate combination of skills to oversee the programs and manage the data effectively. It seems to me that many traditional scientific degree programs typically allow students to perform data management using spreadsheet programs, which are not appropriate for the types of data that we now collect as part of our monitoring efforts. Towards that end, scientists that also have extensive knowledge of database design and programming (e.g., MS-Access, SQL, Oracle), MATLAB (or similar), website programming (with various software), mapping programming (e.g., ArcGIS) and other software languages (e.g., visual basic, java, etc) are rare and valuable. Our attempts to hire true programmers that do not have scientific backgrounds have not been entirely successful, as we experience extended learning times for such individuals to get up to speed, and then subsequent high turnover as is customary in the computer programming field. Dr. Campbell’s proposed program appears to target exactly the type of need I have experienced with our monitoring program.

Please feel free to contact me if you wish more information regarding the types of skills we require as part of our monitoring programs.

Sincerely,

Jim Simmonds
Supervisor, Water Quality and Quantity Unit
Water and Land Resources Division
King County Department of Natural Resources and Parks
201 South Jackson Street, Suite 600
Seattle, Washington 98104
206-296-1986
jim.simmonds@metrokc.gov

cc: Dr. Lisa Campbell
February 25, 2004

Dr. Lisa Campbell  
Associate Professor of Oceanography and Biology  
Department of Oceanography  
3146 TAMU  
Texas A&M University  
College Station, TX  77843-3146

Dear Dr. Campbell:

I have had the opportunity to review the proposal for a TAMU Graduate Certification Program in Ocean Observing. This is a bold and positive step in asserting TAMU’s educational leadership in Oceanographic subjects including observation, modeling, data assimilation, remote sensing and geographic information systems. We fully support this proposal. Although our engineering graduate students may not opt for the full Certification Program, they may benefit from the availability of the courses in the program.

I wish you much success as this Certification Program is developed.

Sincerely,

Billy L. Edge, Ph.D., P.E.  
W.H. Bauer Professor of Dredging Engineering  
Head, Coastal & Ocean Engineering Division
September 24, 2004

Dr. Wilford Gardner, Head
Department of Oceanography
3146 TAMU
College Station, TX 77843–3146

RE: Letter of support for proposed MS program in Ocean Observing

Dear Dr. Gardner:

Thank you for this opportunity to express my support for the proposed MS program in Ocean Observing Systems at Texas A&M University.

As the State’s Scientific Support Coordinator for oil spill prevention and response, I am responsible for providing technical and scientific advice to the State’s On Scene Coordinator (the state’s lead representative during spill events). Oil spill response costs often exceed one million dollars per day in a large spill. As you may imagine, the pressure to provide timely and accurate information to response managers can be very intense. This is particularly true when I’m directing the state’s spill trajectory modeling team. Knowing the currents, winds, and seastate are crucial to accurate modeling and decision support during these events.

I count myself fortunate to live in a state that foresaw the need for operational, real time ocean observations long before the concept of an Integrated Ocean Observing System captured national attention. Texas has a unique history of state agency involvement in the development and funding of operational ocean observing systems. The Texas Coastal Ocean Observing Network (begun in 1989) and the Texas Automated Buoy System (begun in 1994) are the two largest and most successful examples of this involvement. Many of us in the spill response community (both public and private sector) have benefited from the data provided by these observing systems. I would like to think that there would always be enough qualified
individuals around to improve upon and keep these observing systems running. Recent developments at the national level, however, may put a strain on the existing workforce.

As the state's representative to the Gulf of Mexico Coastal Ocean Observing System (our nascent regional association under the IOOS concept), I am in a position to frequently meet with others from around the country in the process of developing their own coastal ocean observing systems. The IOOS program and the recent report from the President's Commission on Ocean Policy have truly fueled a phenomenal growth in ocean observing activity. The number of ocean observing systems is already growing in both number and sophistication. This growth will require a much larger workforce than is currently available. The individuals meeting this growing demand will require specialized training in systems operations, sensor maintenance, GIS, data management, data analysis, and a host of other skills.

It is to Texas A&M's credit that they have foreseen the growth in ocean observing efforts nation-wide and are taking steps to meet the training requirements of a new workforce. The curriculum outlined for the TAMU Ocean Observing MS program is well thought out and provides the right combination of coursework to fill this growing demand. Texas and the nation will be well served by the addition of this new degree program at Texas A&M University.

Sincerely,

Robert D. Martin, Jr. PhD
State Scientific Support Coordinator
Oil Spill Prevention & Response

RDM/rdm

Cc: Greg Pollock
MEMORANDUM

To: Dr. Douglas Sherman, Department Head
   Department of Geography

From: Dr. Wilford Gardner, Department Head
       Department of Oceanography

Subject: Masters in Geosciences- Track in Ocean Observing Systems

The Department of Oceanography and College of Geosciences has proposed a new non-thesis graduate program in Ocean Observing Systems (M. Gsc.- Ocn. Obs.). This will be a designated “Track in Ocean Observing” because of the number of courses that will be required to complete this MS degree.

The College of Geosciences is unique in the range subject matter in which training is available, such as, in situ ocean observations, remote sensing technologies (RS), data analysis and display, including geographic information systems (GIS), analytical techniques and modeling, and an existing ocean observing system element, the Texas Automated Buoy System. Together with the courses offered by your department, we have designed a rigorous curriculum that we believe will train students to meet the growing demand for trained personnel for Ocean Observing. A copy of the proposal for this program is attached. The Department would like to submit this proposal for approval and inclusion in the 2005-2006 graduate catalog. Prior to submission to the University Curriculum Committee, I would like to request that you review the proposal and acknowledge your support for our request. The proposed courses from the Department of Geography include: GEOG 651 (required) and GEOG 660, 661 and 665 (electives).

Please sign below if this request meets with your approval. If you have any questions, please call me or Dr. Lisa Campbell at 845-5706 or by email at wgardner@ocean.tamu.edu or lcampbell@ocean.tamu.edu.

Thank you for your support.

Approved by: [Signature]
Date: 9/13/04

xc: L. Campbell & S. DiMarco, Department of Oceanography
MEMORANDUM

To: Dr. Michael T. Longnecker, Interim Head
Department of Statistics

From: Dr. Wilford Gardner, Head
Department of Oceanography

Subject: Masters in Geosciences- Track in Ocean Observing Systems

The Department of Oceanography and College of Geosciences has proposed a new non-thesis graduate program in Ocean Observing Systems (M. Gsc.- Ocn. Obs.). This will be a designated “Track in Ocean Observing” because of the number of courses that will be required to complete this MS degree.

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Please sign below if this request meets with your approval. If you have any questions, please call me or Dr. Lisa Campbell at 845-5706 or by email at wgardner@ocean.tamu.edu or lcampbell@ocean.tamu.edu.

Thank you for your support.

Approved by: ____________________________ Date: 9-12-2004

Michael Longnecker

xc: L. Campbell & S. DiMarco, Department of Oceanography
MEMORANDUM

8 September 2004

To: Dr. Albert Bogges, Department Head
Department of Mathematics

From: Dr. Wilford Gardner, Department Head
Department of Oceanography

Subject: Masters in Geosciences- Track in Ocean Observing Systems

The Department of Oceanography and College of Geosciences has proposed a new non-thesis graduate program in Ocean Observing Systems (M. Gsc.- Ocn. Obs.). This will be a designated “Track in Ocean Observing” because of the number of courses that will be required to complete this MS degree.

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Please sign below if this request meets with your approval. If you have any questions, please call me or Dr. Lisa Campbell at 845-5706 or by email at wgardner@ocean.tamu.edu or lcampbell@ocean.tamu.edu.

Thank you for your support.

Approved by: [Signature] Date: 9/19/04

xc: L. Campbell & S. DiMarco, Department of Oceanography
MEMORANDUM

8 September 2004

To: Dr. Richard Orville, Department Head
   Department of Atmospheric Sciences

From: Dr. Wilford Gardner, Department Head
       Department of Oceanography

Subject: Masters in Geosciences- Track in Ocean Observing Systems

The Department of Oceanography and College of Geosciences has proposed a new non-thesis graduate program in Ocean Observing Systems (M. Gsc.- Ocn. Obs.). This will be a designated “Track in Ocean Observing” because of the number of courses that will be required to complete this MS degree.

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Please sign below if this request meets with your approval. If you have any questions, please call me or Dr. Lisa Campbell at 845-5706 or by email at wgardner@ocean.tamu.edu or lcampbell@ocean.tamu.edu.

Thank you for your support.

Approved by: [Signature]
Date: 9/8/2004

xc: L. Campbell & S. DiMarco, Department of Oceanography
MEMORANDUM

8 September 2004

To: Dr. C. J. Smith, Department Head

From: Dr. Wilford Gardner, Department Head
Department of Oceanography

Subject: Masters in Geosciences- Track in Ocean Observing Systems

The Department of Oceanography and College of Geosciences has proposed a new non-thesis graduate program in Ocean Observing Systems (M. Gsc.- Ocn. Obs.). This will be a designated “Track in Ocean Observing” because of the number of courses that will be required to complete this MS degree.

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Please sign below if this request meets with your approval. If you have any questions, please call me or Dr. Lisa Campbell at 845-5706 or by email at wgardner@ocen.tamu.edu or lcampbell@ocen.tamu.edu.

Thank you for your support.

Approved by: [Signature] Date: 9/24/04

xc: L. Campbell & S. DiMarco, Department of Oceanography