

**Florida Board of Governors
Request to Offer a New Degree Program**

University of South Florida
University Submitting Proposal

Spring 2012
Proposed Implementation Date

College of Engineering
Name of College or School

Civil & Environmental Engineering
Name of Department(s)

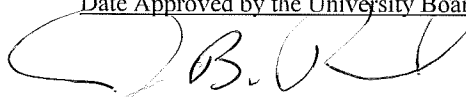
Engineering
Academic Specialty or Field

PhD Environmental Engineering
Complete Name of Degree
(Include Proposed CIP Code): 14.1401

The submission of this proposal constitutes a commitment by the university that, if the proposal is approved, the necessary financial resources and the criteria for establishing new programs have been met prior to the initiation of the program.

September 2, 2011
Date Approved by the University Board of Trustees


President Date


Signature of Chair, Board of Trustees Date


Vice President for Academic Affairs Date 9/7/11

Provide headcount (HC) and full-time equivalent (FTE) student estimates of majors for Years 1 through 5. HC and FTE estimates should be identical to those in Table 1. Indicate the program costs for the first and the fifth years of implementation as shown in the appropriate columns in Table 2. Calculate an Educational and General (E&G) cost per FTE for Years 1 and 5 (Total E&G divided by FTE)

Implementation Time Frame	Projected Student Enrollment (from Table 1)		Projected Program Costs (from Table 2)		
	HC	FTE	Total E&G Funding	Contract & Grants Funding	E&G Cost per FTE
Year 1	30	22.5	129,767	\$450,000	\$5,767
Year 2	30	22.5			
Year 3	35	26.25			
Year 4	35	26.25			
Year 5	40	29.5	141,456	\$594,000	\$4,795

Note: This outline and the questions pertaining to each section must be reproduced within the body of the proposal to ensure that all sections have been satisfactorily addressed.

INTRODUCTION

I. Program Description and Relationship to System-Level Goals

A. Briefly describe within a few paragraphs the degree program under consideration, including (a) level; (b) emphases, including concentrations, tracks, or specializations; (c) total number of credit hours; and (d) overall purpose, including examples of employment or education opportunities that may be available to program graduates.

The USF College of Engineering proposes to implement a PhD in Environmental Engineering that will replace the existing Environmental Engineering track within the PhD in Civil Engineering.

The primary goal of the PhD Environmental Engineering program is to allow students to perform specialized training and research, which will result in award of a degree that recognizes the student's scholarly competence and ability to practice, and conduct and report original and significant environmental engineering research. The total minimum credits required for a student with a Master's degree is 48 credits and the total minimum credits required for a student without a Master's degree is 78 credits. PhD students may work in one or more of the following specialty areas: 1) Water Quality Engineering, 2) Air Quality Engineering, 3) Fate and Transport of Contaminants in the Environment, 4) Waste Management, 5) Sustainable Design and Sustainable Engineering, and, 6) Environmental Biotechnology Applied to Environmental Problems.

The proposed program integrates with research strengths developed at USF related to water, sustainable development and green design, public health, global sustainability, and environmental biotechnology. USF is the only university in Florida with a College of Public Health, College of Marine Science, and School of Global Sustainability. These provide unique training and research collaboration opportunities with a doctoral program in Environmental Engineering. Environmental Engineering has emerged as a distinct discipline in the past decade and the proposed program would not only respond to current demand in the workforce, but also allow us to recruit a high caliber, diverse group of students who are seeking an Environmental Engineering degree versus a civil engineering degree. A PhD program is needed to allow Florida to advance, via research and creation of new information and technology, a knowledge-based economy to manage the many environmental stressors on its water, land, and air resources which impacts social and economic opportunities for current and future generations.

In terms of being a distinct discipline, in 2006 Environmental Engineering was recognized as a distinct specialty on professional engineering licensing exams. In term of its size, engineers held approximately 1.5 million jobs in the United States and environmental engineering ranked #8 in terms of the total number. The U.S. Bureau of Labor Statistics counted over 54,300 environmental engineers employed in the U.S. in 2008. They project that environmental engineers are expected to have employment growth of 31 percent between now and 2018, one of the highest in growth of all engineering disciplines and much faster than the average for all occupations.¹ Furthermore, the upper range of environmental engineers employed is as high as 100,000.²

In addition, *Empower Me Magazine* (May 10, 2010)³ listed Environmental Engineering as one of five of "the hottest green, environmental and infrastructure jobs for the next ten years" They state that environmental engineers jobs are slated to grow over 30% and are included in the 30 fastest growing occupations for the decade of 2008-2018. *CNNMoney.com* reported in 2010 that Environmental Engineering was the 5th best job available (out of 100 ranked).⁴ They stated "An undergraduate degree in any engineering specialty can be enough, and a state license is not always required. But you'll fare better with a graduate degree in environmental engineering,"

¹ U.S. Bureau of Labor Statistics, <http://www.bls.gov/oco/ocos027.htm>

² S. Jones et al., "An Initial Effort to Count Environmental Engineers in the USA," *Environmental Engineering Science*, 22(6):772-787, 2005

³ <http://www.empowermemagazine.com/?s=environmental+engineering> <accessed December 27, 2010>

⁴ <http://money.cnn.com/magazines/moneymag/bestjobs/2010/snapshots/5.html> <accessed December 27, 2010>

and a recent *NY Times* article (June 24, 2011)⁵ discussed the appeal that environmental sustainability related professions have to college graduates.

B. Describe how the proposed program is consistent with the current State University System (SUS) Strategic Planning Goals. Identify which goals the program will directly support and which goals the program will indirectly support. (See the SUS Strategic Plan at <http://www.flbog.org/StrategicResources/>)

This program meets the economic development goals of the SUS Strategic Plan with its focus on Healthy Communities; Research and Innovation; Integrated Interdisciplinary Inquiry; and Community Engagement. The goals that are directly supported include: 1) access to and production of degrees; 2) meet statewide professional and workforce needs, 3) building world-class academic programs and research capacity, and, 4) meeting community needs and fulfilling unique institutional responsibilities. As stated earlier, the proposed degree program addresses economic and community needs and will allow for the development of a world-class educational effort in environmental engineering. There will be practice and research opportunities for students throughout the program and the ability to interact with experts statewide, nationally, and internationally.

This program will help meet the needs of Florida communities because by definition, environmental engineering is that branch of engineering concerned with the application of scientific and engineering principles for: 1) protection of human populations from the effects of adverse environmental factors; and, 2) protection of environments, both local and global from the potentially deleterious effects of natural and human activities; and improvement of environmental quality. We expect to develop a program that produces 5-6 PhD graduates per year. Florida (and the Nation) is in need of graduate level environmental engineering students. For example Engineering News Record (ENR) (www.enr.com) reports that the environmental engineering design market now exceeds \$30 billion in annual revenue and all of the top 15 companies on the ENR list of design firms have offices in Florida. *CNNMoney.com* reported in 2010 that environmental engineering was the 5th best job available (out of 100 ranked).⁶ However, they stated “An undergraduate degree in any engineering specialty can be enough, and a state license is not always required. But you'll fare better with a graduate degree in environmental engineering.” In addition, USF has also invested considerable resources in environmental engineering over the past eight years with the hiring of eight faculty who specialize in environmental engineering.

Institutional and State Level Accountability

II. Need and Demand

A. Need: Describe national, state, and/or local data that support the need for more people to be prepared in this program at this level. Reference national, state, and/or local plans or reports that support the need for this program and requests for the proposed program which have emanated from a perceived need by agencies or industries in your service area. Cite any specific need for research and service that the program would fulfill.

The American Academy of Environmental Engineers (AAEE) defines Environmental Engineering as that branch of engineering concerned with the application of scientific and engineering principles for: 1) protection of human populations from the effects of adverse environmental factors; and, 2) protection of environments, both local and

⁵ “Green Jobs Attract Graduates,” *NY Times*, June 24, 2011.

⁶ <http://money.cnn.com/magazines/moneymag/bestjobs/2010/snapshots/5.html> <accessed December 27, 2010>

global from the potentially deleterious effects of natural and human activities; and improvement of environmental quality.

Besides careers in research, academics, and government, the 2009 Body of Knowledge published by the American Academy of Environmental Engineers⁷ reports that engineers in the consulting engineering field usually have doctoral degrees. As stated previously, the **U.S. Bureau of Labor** predicts that environmental engineers are expected to have employment growth of 31 percent between now and 2018, one of the highest growth of all engineering disciplines and much faster than the average for all occupations.⁸ In addition, *Empower Me Magazine* (May 10, 2010)⁹ listed environmental engineering as one of five of “the hottest green, environmental and infrastructure jobs for the next ten years” They state that environmental engineers jobs are slated to grow over 30% and are included in the 30 fastest growing occupations for the decade of 2008-2018. *CNNMoney.com* reported in 2010 that environmental engineering was the 5th best job available (out of 100 ranked).¹⁰ They stated “An undergraduate degree in any engineering specialty can be enough, and a state license is not always required. But you'll fare better with a graduate degree in environmental engineering.”

Engineering News Record (ENR) (www.enr.com) reports that the environmental engineering design market exceeds \$30 billion in annual revenue and all of the top 15 companies on the ENR list of the largest environmental engineering design firms have offices in Florida. Many environmental problems in Florida result from the large concentrations of humans and infrastructure that exist at the water-urban interface. In fact, Florida shows some of the highest increases in population on the urban-coastal interface.¹¹ Some important program areas of the Florida Department of Environmental Protection (FDEP) include water, wastewater, air, brownfield redevelopment, and waste management. Brownfields are properties where expansion, redevelopment or reuse may be complicated by the presence or potential presence of environmental pollution.

Florida currently has the largest desalination plant in the U.S. (near Tampa) that converts seawater to drinking water. Florida also ranks with California as the two largest consumers of reclaimed (i.e., reused) water. Related to water quality, in November, 2010, the U.S. Environmental Protection Agency established final numeric nutrient water quality standards for lakes and flowing waters in Florida. This action was “pursuant to a January 2009 Clean Water Act determination and a consent decree with Florida Wildlife Federation to settle a 2008 lawsuit.”¹² Also, an existing project to restore, protect and preserve the water resources of central and southern Florida, including the Everglades covers 16 counties over an 18,000-square-mile area and is estimated to take 30 years to design and construct with a current estimate of \$9.5 billion for the 60+ projects.¹³

Florida's population is expected to increase to 22 million by the year 2020 and freshwater needs are expected to grow from 8.2 to 9.1 billion gallons per day.¹⁴ In terms of water scarcity issues, the Florida Legislature has established "the encouragement and promotion of reuse of reclaimed water and water conservation..." as formal state objectives in Section 403.064(1), Florida Statutes (F.S.), and Section 373.250, F.S. The Florida Department of Environmental Protection along with Region 4 of the Environmental Protection Agency, the Florida Department of Health, Florida's five water management districts, the Public Service Commission, the Florida

⁷ <http://www.aace.net/Website/EEBoK.htm> <accessed December 27, 2010>

⁸ U.S. Bureau of Labor Statistics, <http://www.bls.gov/oco/ocos027.htm>

⁹ <http://www.empowermemagazine.com/?s=environmental+engineering> <accessed December 27, 2010>

¹⁰ <http://money.cnn.com/magazines/moneymag/bestjobs/2010/snapshots/5.html> <accessed December 27, 2010>

¹¹ Thomas J. Culliton, 1998, Population: Distribution, Density, and Growth, NOAA's State of the Coast Report, National Oceanic and Atmospheric Administration (NOAA), Silver Spring, MD

¹² US Environmental Protection Agency, http://water.epa.gov/lawsregs/rulesregs/florida_index.cfm <accessed March 6, 2011>

¹³ US Army Corps, http://www.evergladesplan.org/about/about_cerp_brief.aspx <accessed March 6, 2011>

¹⁴ Florida Council of 100, 2003, <http://www.fc100.org/> <accessed March 6, 2011>

Department of Agriculture and Consumer Services, and the Florida Department of Community Affairs have developed the Statement of Support for Water Reuse in Florida. The Tampa-Clearwater-St. Petersburg Metro area is a perfect location to conduct this type of research. It has undergone some of the most rapid development in the US in the last three decades (Tampa Dept. Planning and Technology 2008). This area is water scarce, has a population learning to face water scarcity issues, and is situated in a state that is 90% dependent on groundwater for its water needs. There are also now 252 brownfield areas designated in Florida. Brownfields are properties where expansion, redevelopment or reuse may be complicated by the presence or potential presence of environmental pollution. The Florida Brownfields Program reports that to date, “the program has created nearly 30,000 new direct and indirect jobs and resulted in almost \$1.68 billion of capital investment over the last 11 years.”¹⁵

Lastly, one of the five principal conclusions that emerged from the 2008 Florida Energy and Climate Change Action Plan (www.flclimatechange.us) (using guidance provided in Executive Order 07-128) is that based upon the findings of the 4th Assessment of the Intergovernmental Panel on Climate Change, Florida’s resources, communities, and economy are expected to experience significant impacts if the current trajectory of global greenhouse gas emissions is not reversed.

The future need for environmental engineers is strongly integrated with the U.S. Environmental Protection Agency’s seven future priorities listed by Administrator Lisa Jackson¹⁶. The following five, directly require the problem solving skills inherent to the technical discipline of environmental engineering: 1) Taking Action on Climate Change; 2) Improving Air Quality; 3) Assuring the Safety of Chemicals; 4) Cleaning Up Our Communities (of wastes), and, 5) Protecting America’s Waters.

Research needs in environmental engineering also continue to grow. For example, the National Science Foundation now funds research not only in environmental engineering, but also through programs created in “environmental sustainability” and “water, sustainability, and climate.” The proposed PhD program’s specialty areas match well with majority of research plans of EPA’s Office of Research & Development including: 1) Water Quality Engineering, 2) Air Quality Engineering, 3) Fate and Transport of Contaminants in the Environment, 4) Waste Management, 5) Sustainable Design and Sustainable Engineering, and, 6) Environmental Biotechnology Applied to Environmental Problems.

The proposed program will build on research strengths developed at USF that include: 1) fresh and ocean water resources, 2) sustainable development and sustainable design, and, 3) environmental biotechnology applied to treatment of environmental contaminants and development of renewable energy. Important to this proposal, the USF environmental engineering graduate program is currently well integrated via many existing externally funded research projects with USF research strengths related to community engagement, renewable energy, social & behavioral sciences through anthropology, public health, and global sustainability.

USF is the only university in Florida with a College of Public Health, College of Marine Sciences, and School of Global Sustainability. These provide unique training and research collaboration opportunities with a doctoral graduate program in Environmental Engineering to advance social, economic, and environmental needs of current and future generations of Floridians. USF Environmental Engineering graduate students currently take courses offered by the College of Public Health and Department of Applied Anthropology and there is existing collaboration between faculty in environmental engineering, public health, and applied anthropology in obtaining external research funding. By its definition environmental engineering is involved with protection of human populations from the effects of adverse environmental factors. USF is also the only university in Florida that has

¹⁵ Florida Brownfield Association, <http://www.floridabrownfields.org/displaycommon.cfm?an=1&subarticlenbr=18> <accessed March 6, 2011>

¹⁶ <http://blog.epa.gov/administrator/2010/01/12/seven-priorities-for-epas-future/> <accessed December 27, 2010>.

formal graduate school partnerships with the U.S. Peace Corps in the areas of environmental engineering, civil engineering, and global health. This partnership allows graduate Environmental Engineering students to combine their graduate education with 10 weeks of international training and 2 years of service as a water/sanitation engineer (see <http://cee.eng.usf.edu/peacecorps/>).

B. Demand: Describe data that support the assumption that students will enroll in the proposed program. Include descriptions of surveys or other communications with prospective students.

USF's existing Master's program in Environmental Engineering has grown significantly in the past few years with core graduate class enrollment now exceeding thirty to forty students per course offering. This includes development of a Master's level graduate program that combines training and service with the U.S. Peace Corps and has a focus on sustainable development that has grown to 33 students in 2.5 years (the students in this program are from 31 different U.S. universities that represent 21 states).

We have already had many requests from current or prospective students about the offering of a doctoral degree in Environmental Engineering. Environmental Engineering is a popular program that students will want to participate in. Our internal survey of students currently enrolled in the PhD Civil Engineering program who emphasize Environmental Engineering suggested that close to 90% would select such a program.¹⁷ Currently USF offers two degrees that specifically have "environmental engineering" in the degree title. They are: 1) a 30-credit thesis-based Master of Science in Environmental Engineering and 2) a 30-credit coursework only Master of Environmental Engineering Degree. Graduate courses required for these degrees now have annual enrollments that range from 25 to over 40 students.

The number of students currently majoring in the PhD Civil Engineering major at USF who are concentrating on Environmental Engineering exceeds 30. This number of doctoral students in the classroom and individual faculty research groups does not pose a problem in terms of faculty workload. The Department currently has eight faculty members whose specialty is Environmental Engineering, and the Environmental Engineering program has gained national recognition over the past several years. In 2010 the Department won a competitive proposal to host the 2011 Education and Research Conference of the Association of Environmental Engineering and Science Professors (AEESP) (see <http://aeesp2011.com/>).

C. If similar programs (either private or public) exist in the state, identify the institution(s) and geographic location(s). Summarize the outcome(s) of any communication with such programs with regard to the potential impact on their enrollment and opportunities for possible collaboration (instruction and research). Provide data that support the need for an additional program.

Currently there are two similar programs in Florida. The University of Central Florida (UCF) offers a PhD in Environmental Engineering. The Graduate Coordinator at the University of Central Florida (Dr. Mohamed Abdel-Aty) was contacted about USF's proposed program and was supportive of our effort. He suggested there may be a minor impact on UCF enrollment and expressed an interest in collaborating with our group. The University of Florida offers a doctoral degree in Environmental and Engineering Sciences that shares the 14.1401 CIP code.

¹⁷ Conducted in March, 2011.

The proposed program will differ from the programs at UF and UCF because of some research strengths developed at USF in: 1) fresh and ocean water resources, 2) sustainable development and sustainable design, and, 3) environmental biotechnology applied to treatment of environmental contaminants and development of renewable energy. Important to this proposal, the USF Environmental Engineering graduate program is currently well integrated via many existing externally funded research projects with USF research strengths related to community engagement, renewable energy, social & behavioral sciences through anthropology, public health, and global sustainability.

Further, USF is the only university in Florida with a College of Public Health, College of Marine Sciences, and School of Global Sustainability. These provide unique training and research collaboration opportunities with a doctoral graduate program in Environmental Engineering to advance social, economic, and environmental needs of current and future generations of Floridians. USF Environmental Engineering graduate students currently take courses offered by the College of Public Health and Department of Applied Anthropology and there is existing collaboration between faculty in Environmental Engineering, public health, and applied anthropology in obtaining external research funding. By its definition (provided in Section II) Environmental Engineering is involved with protection of human populations from the effects of adverse environmental factors. One Environmental Engineering faculty member (Dr. Amy Stuart) is appointed in the College of Public Health in the Department of Environmental and Occupational Health which provides this proposed doctoral program a direct line of communication to this important collaborator. Drs. Mihelcic and Stuart also teach graduate courses which are co-listed between the Colleges of Engineering and Public Health. There is also an interdisciplinary environmental research colloquium course taken by many Environmental Engineering graduate students that is co-taught by faculty members in environmental science & policy, environmental engineering, and public health.

Environmental Engineering faculty members are also collaborating with staff and affiliated faculty at the School of Global Sustainability (SGS) on research and teaching courses required for the MA degree in Global Sustainability. The SGS has a research mission to generate innovations and new knowledge that will help cities around the world, including those in developing countries, to reduce their ecological footprint while improving their form and function to make them healthier, more livable, and more resilient. The research area related to provision of resilient and sustainable infrastructure also is related to existing collaborations between USF's Environmental Engineering graduate program and USF strengths in sustainability provided through the SGS, green engineering initiatives taking place in several departments in the College of Engineering.

USF is also the only university in Florida that has formal graduate school partnerships with the U.S. Peace Corps in the areas of environmental engineering, civil engineering, and global health. This partnership allows graduate environmental engineering students to combine their graduate education with 10 weeks of international training and 2 years of service as a water/sanitation engineer (see <http://cee.eng.usf.edu/peacecorps/>). Students then integrate their service with an international research experience. Research areas have included: water supply and treatment, provision of sanitation, bioenergy, hygiene promotion, and solid waste management. USF currently has 32 engineering students enrolled in this program, in both the M.S. and Ph.D. programs. The USF - Peace Corps graduate partnerships in engineering and global health provide unique research opportunities for environmental engineering doctoral students interested in issues related to global sustainability.

We contacted every other graduate engineering program within Florida that had some component of environmental engineering research present (most are housed within Civil Engineering units). Communication was made by email or personal contact with each individual in the "contact" column. All contacts responded. No negative comments were received as shown in the following table. Florida A&M was interested in exploring exchange of distance learning courses at the graduate level. The University of Florida and the University of Central Florida were both supportive of our efforts and both schools expressed an interest in collaborating with our group. The University of Miami saw no conflict and also expressed interest in collaboration.

Letters of support were provided by UF and UCF, the two institutions with existing doctoral programs in CIP 14.1401, and are attached to this proposal.

Table. The following individuals were contacted on January 18, 2011.

University	Location	Title of doctoral degree	Contact
University of Florida	Gainesville	Environmental Engineering Sciences	Dr. Paul A. Chadik, Professor and Chair pchad@eng.ufl.edu
Florida A&M University and Florida State University	Tallahassee	Civil & Environmental Engineering	Kamal Tawfiq, Professor and Chair tawfiq@eng.fsu.edu
University of Central Florida	Orlando	Environmental Engineering	Mohamed Abdel-Aty, Professor & Graduate Coordinator mabdel@mail.ucf.edu
Florida International University	Miami	Civil Engineering	Hector R. Fuentes, Professor and Senior Environmental Engrg faculty member fuentes@fiu.edu
University of Miami	Miami	Civil Engineering	Dr. James Englehardt, Professor and Senior Environmental Engrg faculty member, jenglehardt@miami.edu

D. Use Table 1 (A for undergraduate and B for graduate) to categorize projected student headcount (HC) and Full Time Equivalents (FTE) according to primary sources. Generally undergraduate FTE will be calculated as 40 credit hours per year and graduate FTE will be calculated as 32 credit hours per year. Describe the rationale underlying enrollment projections. If, initially, students within the institution are expected to change majors to enroll in the proposed program, describe the shifts from disciplines that will likely occur.

Based on our current enrollment in the existing Environmental Engineering track in the PhD Civil Engineering program and a survey of our graduate population, we anticipate that our student body will be comprised of a mixture of domestic (both residents and non-resident) and international students. We expect enrollment to initially be 30 full-time students as many current doctoral students switch from the PhD Civil Engineering program to the PhD Environmental Engineering program. After that we expect steady growth in students who will identify with the new program and expect enrollment to grow to 40 full-time students.

E. Indicate what steps will be taken to achieve a diverse student body in this program, and identify any minority groups that will be favorably or unfavorably impacted. The university's Equal Opportunity Officer should read this section and then sign and date

Data suggest that underrepresented groups in STEM disciplines, particularly women, are attracted to careers where they feel that they can have a positive impact on the environment and society. Students are now looking to merge personal convictions with career; learn how to apply technology that is culturally, economically, and socially suitable; and apply their educational skills for protecting ecosystems and natural resources.¹⁸

¹⁸ Widnall, S., *Digits of pi: Barriers and Enablers for Women in Engineering*, in *S.E. Regional NAE Meeting*. 2000: Georgia Institute of Technology. Hokanson, D.R., J.R. Mihelcic, L.D. Phillips, "Educating Engineers in the Sustainable Futures

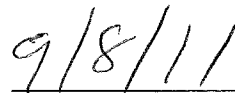
There has been a steady increase in enrollment of under-represented minorities in the PhD Civil Engineering program over the past years. The past two years (2008, 2009) has seen a total of 9 under-represented minority PhD students enrolled each year (of 52 total in fall, 2009). In regards to gender, female enrollment in the doctoral program was 18 (of 52 total in fall, 2009). Mr. Bernard Batson serves as full time director for diversity and outreach programs in the College of Engineering and assists with recruitment of these students in the department. A number of our graduate students are funded through the NSF Bridge to Doctorate Program, the Alfred P. Sloan Fellowship Program, the McKnight Fellowship Program, among others. Recent large grants from the Department of Education (under the Graduate Assistantships in Areas of National Need [GAANN] Program) and the National Science Foundation (under the S-STEM and STARS programs) have provided priority funding for female and minority students who are underrepresented in STEM disciplines. Several student organizations, including the Florida-Georgia Louis Stokes Alliance for Minority Participation Club, the National Society of Black Engineers (NSBE), the Society of Hispanic Professional Engineers (SHPE), and the Society of Women Engineers (SWE), support these students and create a collegial learning environment in the college. A number of faculty members have been approved as research mentors for under-represented minority students under the Louis Stokes Alliances for Minority Participation (LSAMP) Program.

We also plan to utilize our existing marketing and recruitment strategies through professional associations (e.g., Association of Environmental Engineering & Science Professors) and conferences run by professional societies (e.g., Water Environmental Federation, American Geological Association, Air & Waste Management Association, Water Reuse Association, American Chemical Society) and other mediums and venues to work as partners with the USF College of Engineering, Graduate School, and the Office of International Affairs to promote the program. We will also be able to add the new degree to the searchable graduate program list server maintained by the Association of Environmental Engineering & Science Professors.

In terms of international students, we plan to reach out especially to our partnering international institutions including Ocean and Nankai Universities (environmental science) in China and Exeter University (water resources program) in the United Kingdom. Exeter, USF, and King Abdulaziz University (Saudi Arabia) were awarded a grant in March 2011 to build a research partnership around sustainable water, wastewater, and stormwater management by the British Council International Higher Education Programme with a focus on Strategic Partnerships. We have also developed an existing partnership with two universities in Hanoi Vietnam: Hanoi University and Vietnam Academy of Science and Technology (Memorandum of Understanding signed November, 2009). USF has also signed a memorandum of understanding with the UNESCO-IHE Water Laboratory in Delft (Netherlands) that provides for student exchanges.



Ted Williams, Ph.D.
Associate Vice President, Diversity and Equal Opportunity
University of South Florida



Date

III. Budget

A. Use Table 2 to display projected costs and associated funding sources for Year 1 and Year 5 of program operation. Use Table 3 to show how existing Education & General funds will be shifted to support the new program in Year 1. In narrative form, summarize the contents of both tables, identifying the source of both current and new resources to be devoted to the proposed program. (Data for Year 1 and Year 5 reflect snapshots in time rather than cumulative costs.)

Most funding for the proposed program (except for faculty salaries and benefits) will be supplied by external grants. Doctoral students will be supported as Department Teaching or Research Assistants. Teaching Assistants work as graders for courses or help with laboratory courses and problem sessions. They are supported from the Department's OPS budget. Research Assistants are supported from professor's research contracts or start-up funds for new faculty. Funding in the environmental engineering areas comes from state agencies, local municipalities, private industry, or federal funding (e.g., NSF, EPA). A number of graduate students are currently funded through large fellowship and scholarship programs supported by competitive funding obtained from the federal government. For example, an environmental engineering faculty member is the lead PI on a recently secured \$750,000+ Department of Education Graduate Assistantships in Areas of National Need (GAANN) Grant, which provides stipends, tuition and supply funds for doctoral students working in fields or water, energy and materials with a focus on sustainability. Four environmental engineering faculty members have also secured a \$600,000 National Science Foundation S-STEM Scholarship grant that provides funding for master's and doctoral graduate students with interests in providing sustainable water and transportation infrastructure.

B. If other programs will be impacted by a reallocation of resources for the proposed program, identify the program and provide a justification for reallocating resources. Specifically address the potential negative impacts that implementation of the proposed program will have on related undergraduate programs (i.e., shift in faculty effort, reallocation of instructional resources, reduced enrollment rates, greater use of adjunct faculty and teaching assistants). Explain what steps will be taken to mitigate any such impacts. Also, discuss the potential positive impacts that the proposed program might have on related undergraduate programs (i.e., increased undergraduate research opportunities, improved quality of instruction associated with cutting-edge research, improved labs and library resources).

As mentioned previously, there will be some short term decline in the PhD Civil Engineering enrollment as some students switch to the PhD Environmental Engineering program. We believe the proposed program will enhance undergraduate education and research by serving as a mechanism for students in a wide variety of engineering disciplines to continue their studies in Environmental Engineering at USF. Undergraduate engineering students will have opportunities to participate with the doctoral students in the proposed program in the development of undergraduate research or employment opportunities through professional ties developed between faculty members and external funding agencies.

C. Describe other potential impacts on related programs or departments (e.g., increased need for general education or common prerequisite courses, or increased need for required or elective courses outside of the proposed major).

There is no expected impact on related programs or departments related to increased need for courses. All required courses are already offered at USF.

D. Describe what steps have been taken to obtain information regarding resources (financial and in-kind) available outside the institution (businesses, industrial organizations, governmental entities, etc.). Describe the external resources that appear to be available to support the proposed program.

External funding in the environmental engineering area comes from state agencies, local municipalities, professional organizations (e.g., U.S. Green Building Council), private industry, and federal funding (e.g., NSF, EPA). A number of graduate students are currently funded through large fellowship and scholarship programs supported by competitive funding obtained from the federal government. For example, one environmental engineering faculty member is the lead PI for a recently secured a \$750,000+ Department of Education Graduate Assistantships in Areas of National Need (GAANN) Grant, which provides stipends, tuition and supply funds for doctoral students working in fields of water, energy and materials with a focus on sustainability. Four environmental engineering faculty members have also secured a \$600,000 National Science Foundation S-STEM Scholarship grant that provides funding for master's and doctoral students with interests in providing sustainable water and transportation infrastructure.

IV. Projected Benefit of the Program to the University, Local Community, and State

A. Use information from Table 1, Table 2, and the supporting narrative for "Need and Demand" to prepare a concise statement that describes the projected benefit to the university, local community, and the state if the program is implemented. The projected benefits can be both quantitative and qualitative in nature, but there needs to be a clear distinction made between the two in the narrative.

There will be immense benefit to USF and Florida with the development of the proposed program. By definition, environmental engineering is concerned with the application of scientific and engineering principles for: 1) protection of human populations from the effects of adverse environmental factors; and, 2) protection of environments, both local and global from the potentially deleterious effects of natural and human activities; and improvement of environmental quality. The program will help to further advance interdisciplinary training and research ties with the USF School of Global Sustainability, College of Marine Science, Department of Global Health, PhD program in Applied Anthropology, and across other science and engineering disciplines.

Florida's population is dependent on its water, land, and air resources for many current and future economic and societal benefits. Stressors of increasing population, changes in land use, loss of biodiversity, increased population density in counties near water resources, and potential impacts from climate change on societal infrastructure all will require training of engineers to solve problems associated with these stressors, as well as creation of new knowledge through research.

USF environmental engineering faculty members have existing research projects related to improving the social and economic climate of Florida, including projects on: production of algal biofuels from wastewater, sustainable

production of aquaculture, sustainable design and management of water and transportation, investigation of fate of emerging contaminants found in reused water, and impact that urban design has on air quality. Just by its geographical location, 16 of Florida's 21 metropolitan areas are built around an estuary or lie at the mouth of a river that flows into the ocean.¹⁹ In addition, in terms of economic importance, in 2004, Florida's coastal counties had 17,714 ocean sector establishments, which contributed to over 500,300 jobs and \$12.7 billion in wages, adding more than \$27.4 billion to Florida's gross domestic product (GDP).²⁰ The water quality of these estuaries and rivers is strongly dependent on how human activities on land are designed and managed, something that environmental engineering doctoral graduates can contribute to.

The graduates from the proposed program will clearly benefit the State of Florida, the nation, and the world due to their ability to enhance environmental protection and sustainability. Florida (and the Nation) is in need of graduate level environmental engineering students. For example Engineering News Record (ENR) (www.enr.com) reports that the environmental engineering design market now exceeds \$30 billion in annual revenue and all of the top 15 companies on the ENR list of top environmental engineering design firms have offices in Florida. Our expected graduation of 5-6 PhD Environmental Engineering students per year will help support these local businesses.

V. Access and Articulation – Bachelor's Degrees Only-N/A

A. If the total number of credit hours to earn a degree exceeds 120, provide a justification for an exception to the policy of a 120 maximum and submit a request to the BOG for an exception along with notification of the program's approval. (See criteria in BOG Regulation 6C-8.014)

Not applicable

B. List program prerequisites and provide assurance that they are the same as the approved common prerequisites for other such degree programs within the SUS (see Common Prerequisite Manual <http://www.facts.org>). The courses in the Common Prerequisite Counseling Manual are intended to be those that are required of both native and transfer students prior to entrance to the major program, not simply lowerlevel courses that are required prior to graduation. The common prerequisites and substitute courses are mandatory for all institution programs listed, and must be approved by the Articulation Coordinating Committee (ACC). This requirement includes those programs designated as "limited access."

Not applicable

C. If the proposed prerequisites are not listed in the Manual, provide a rationale for a request for exception to the policy of common prerequisites. NOTE: Typically, all lower-division courses required for admission into the major will be considered prerequisites. The curriculum can require lower-division courses that are not prerequisites for admission into the major, as long as those courses are built into the curriculum for the upper-level 60 credit hours. If there are already common prerequisites for other degree programs with the same proposed CIP, every effort must be made to utilize the previously approved prerequisites instead of recommending an additional

¹⁹ Southeastern Fishing Organization, <http://www.southeasternfish.org/Documents/EcoValueAquatic.pdf> <accessed March 6, 2011>

²⁰ Natural Resources Defense Council, http://docs.nrdc.org/water/files/wat_10052001a.pdf <accessed March 6, 2011>

“track” of prerequisites for that CIP. Additional tracks may not be approved by the ACC, thereby holding up the full approval of the degree program. Programs will not be entered into the State University System Inventory until any exceptions to the approved common prerequisites are approved by the ACC.

Not applicable

D. If the university intends to seek formal Limited Access status for the proposed program, provide a rationale that includes an analysis of diversity issues with respect to such a designation. Explain how the university will ensure that community college transfer students are not disadvantaged by the Limited Access status. NOTE: The policy and criteria for Limited Access are identified in BOG Regulation 6C-8.013. Submit the Limited Access Program Request form along with this document.

Not applicable

E. If the proposed program is an AS-to-BS capstone, ensure that it adheres to the guidelines approved by the Articulation Coordinating Committee for such programs, as set forth in Rule 6A-10.024 (see Statewide Articulation Manual <http://www.facts.org>). List the prerequisites, if any, including the specific AS degrees which may transfer into the program.

Not applicable

INSTITUTIONAL READINESS

VI. Related Institutional Mission and Strength

A. Describe how the goals of the proposed program relate to the institutional mission statement as contained in the SUS Strategic Plan and the University Strategic Plan.

According to its stated mission,²¹ USF is dedicated to excellence in: 1) student access and success in an engaged, and interdisciplinary, learner-centered environment, 2) research and scientific discovery, including the generation, dissemination, and translation of new knowledge across disciplines; to strengthen the economy; to promote civic culture and the arts; and to design and build sustainable, healthy communities, and, 3) embracing innovation, and supporting scholarly and artistic engagement to build a community of learners together with significant and sustainable university-community partnerships and collaborations.

The proposed PhD Environmental Engineering program is directly related to USF’s mission to provide an interdisciplinary, learner-centered environment and generate and translate new knowledge across disciplines, while designing and building sustainable, healthy communities.

University programs such as the one proposed here with a focus in education, research, and outreach related to protection of human health and the environment align with Goals 1, 2, and 3 of the USF Strategic Plan (listed below) and also with national goals that have documented the rapid social, political, economic, and environmental

²¹ USF Strategic plan, <http://www.ods.usf.edu/Plans/Strategic/docs/USF-Strategic-Plan-2007-2012.pdf> <accessed March 6, 2011>

changes occurring in the world and associated implications for education, research, practice, and importantly, the economic competitiveness of our Nation (for example, National Academy of Engineering's *Educating the Engineer of 2020*).²²

- Goal I. Expanding world-class interdisciplinary research, creative, and scholarly endeavors.
- Goal II. Promoting globally competitive undergraduate, graduate and professional programs that support interdisciplinary inquiry, intellectual development, knowledge and skill acquisition, and student success through a diverse, fully- engaged, learner-centered campus environment.
- Goal III. Expanding local and global engagement initiatives to strengthen and sustain healthy communities and to improve the quality of life.

The proposed program meets the economic development goals of the SUS Strategic Plan with its focus on Healthy Communities; Research and Innovation; Integrated Interdisciplinary Inquiry; and Community Engagement. The goals that are directly supported include: 1) access to and production of degrees; 2) meet statewide professional and workforce needs, 3) building world-class academic programs and research capacity, and, 4) meeting community needs and fulfilling unique institutional responsibilities. As stated earlier, this degree program addresses economic and community needs and will allow for the development of a world-class educational effort in environmental engineering. There will be practice and research opportunities for students throughout the program and the ability to interact with experts statewide, nationally, and internationally. In addition, USF has also invested considerable resources in environmental engineering over the past eight years with the hiring of eight faculty who specialize in environmental engineering.

B. Describe how the proposed program specifically relates to existing institutional strengths, such as programs of emphasis, other academic programs, and/or institutes and centers.

USF's strategic plan is focused on interdisciplinary initiatives that strengthen and sustain healthy communities and improve the quality of life. By definition, the discipline of environmental engineering supports these goals. USF has eight environmental engineering faculty members²³ and strong education and research areas in related science/technology disciplines of environmental science, biology, chemical engineering, civil engineering, environmental and occupational health, global health, social sciences, sustainability, and geography. In addition, academic partners in the social sciences (e.g., anthropology) and environmental policy are critical for developing solutions to environmental problems that are not only technical in nature, but also consider societal implications and solutions.

As stated above, USF is the only university in Florida with a College of Public Health, College of Marine Science, and School of Global Sustainability. These provide unique training and research collaboration opportunities with a doctoral graduate program in environmental engineering to advance social, economic, and environmental needs of current and future generations of Floridians. USF environmental engineering graduate students currently take courses offered by the College of Public Health and Department of Applied Anthropology and there is existing collaboration between faculty in environmental engineering, public health, and applied anthropology in obtaining external research funding. By its definition (provided in Section II) environmental

²² *Educating the Engineer of 2020: Adapting Engineering Education to the New Century*, Committee on the Engineer of 2020, Phase II, Committee on Engineering Education, National Academy of Engineering.

²³ For purposes of this proposal, seven of the eight faculty are appointed in Civil & Environmental Engineering (Drs. Cunningham, Ergas, Mihelcic, Stroot, Trotz, Yeh, Q. Zhang) and the eighth is appointed as a faculty member in the Department of Environmental & Occupational Health with a courtesy appointment in Civil & Environmental Engineering (Dr. Stuart).

engineering is involved with protection of human populations from the effects of adverse environmental factors. One environmental engineering faculty member (Dr. Amy Stuart) is appointed in the College of Public Health in the Department of Environmental and Occupational Health which provides this proposed doctoral program a direct line of communication to this important collaborator. Drs. Mihelcic and Stuart also teach graduate courses which are co-listed between the Colleges of Engineering and Public Health. There is also an interdisciplinary environmental research colloquium course taken by many environmental engineering graduate students that is co-taught by faculty members in environmental science & policy, environmental engineering, and public health.

Environmental engineering faculty members are also collaborating with staff and affiliated faculty at the School of Global Sustainability (SGS) on research and teaching courses required for the MA degree in Global Sustainability. The SGS has a research mission to generate innovations and new knowledge that will help cities around the world, including those in developing countries, to reduce their ecological footprint while improving their form and function to make them healthier, more livable, and more resilient. The research area related to provision of resilient and sustainable infrastructure also is related to existing collaborations between USF's Environmental Engineering graduate program and USF strengths in sustainability provided through the SGS, green engineering initiatives taking place in several departments in the College of Engineering.

USF is also the only university in Florida that has formal graduate school partnerships with the U.S. Peace Corps in the areas of environmental engineering, civil engineering, and global health. This partnership allows graduate environmental engineering students to combine their graduate education with 10 weeks of international training and 2 years of service as a water/sanitation engineer (see <http://cee.eng.usf.edu/peacecorps/>). Students then integrate their service with an international research experience. Research areas have included: water supply and treatment, provision of sanitation, bioenergy, hygiene promotion, and solid waste management. USF currently has 32 engineering students enrolled in this program, in both the M.S. and Ph.D. programs. The USF - Peace Corps graduate partnerships in engineering and global health provide unique research opportunities for environmental engineering doctoral students interested in issues related to global sustainability.

This program will also draw on the expertise of USF's new sustainability and community engagement initiatives that include the Office of Sustainability and Office of Community Engagement. USF's Office of International Affairs will be directly involved with the program, especially in terms of international student recruitment. The students will have the opportunity to work with the Office of Sustainability on campus related environmental issues and student professional societies such as: Water Environment Federation, American Water Works Association, Emerging Green Builders, Engineers without Borders, and Engineers for a Sustainable World.

C. Provide a narrative of the planning process leading up to submission of this proposal. Include a chronology (table) of activities, listing both university personnel directly involved and external individuals who participated in planning. Provide a timetable of events necessary for the implementation of the proposed program.

Planning Process

The planning process has largely involved Dr. James R. Mihelcic and the Civil & Environmental Engineering Graduate Director (Dr. Sarina Ergas) in addition to discussions and meetings with faculty members in the Department of Civil & Environmental Engineering, Department Chairs in Engineering, Associate Dean in Engineering, Dean of Engineering, Graduate School, and the Faculty Senate. The environment and sustainability have been major strategic emphases of USF for several years and there has been administrative support through the hiring of eight environmental engineering faculty members over the past eight years.

Table. Chronology of activities leading to developing the proposal.

Date	Participants	Planning Activity
9/2010	James Mihelcic	Development of pre-proposal for PhD Environmental Engineering
10/01/2010	James Mihelcic, Sarina Ergas	Receive comments from Civil & Environmental Engineering Graduate Coordinator
10/08/2010	Rafael A. Perez, Professor and Associate Dean, Academics and Student Affairs, USF College of Engineering	Dr. Perez notified Dr. Mihelcic that the pre-proposal had been approved after discussion at a meeting with Engineering Dean/Associate Deans and Department Chairs in the College of Engineering
10/13/2010	USF Roundtable/Graduate Executive Coordination Committee	Reviewed by Roundtable/Graduate Executive Coordination Committee
10/21/2010	Carol Hines-Cobb, Assistant Director, Academics University of South Florida Graduate School	Carol Hines-Cobb of the USF Graduate School notified Dr. Mihelcic that he could proceed with a full proposal
10/28/2010	James Mihelcic, Civil & Environmental Engineering faculty and department chair	Received comments from Civil & Environmental Engineering faculty at department meeting
1/2011	James Mihelcic	Finalize Program Proposal for submission
1/18/2011	James Mihelcic	Contact made with related university programs in Florida
1/25/2010	James Mihelcic met with chair of USF Chemical & Biomedical Engineering, Venkat R. Bhethanabotla	Received recommendations from experience with biomedical engineering program on issues related to allowing advising of students from outside the Department of Civil & Environmental Engineering. Recommendations were incorporated into proposal.
1/25/2011	James Mihelcic, Jeffrey Cunningham, Wayne Echel berger, Sarina Ergas, Peter Stroot, Amy Stuart, Maya Trotz, Daniel Yeh, Qiong Zhang	Draft document reviewed by USF faculty who specialize in environmental engineering faculty for review and comment. All comments were incorporated into the discussion.
1/31/2011	Faculty members of Civil & Environmental Engineering	Department was provided proposal via email for review and comment
2/3/2011	James Mihelcic, Civil & Environmental Engineering faculty and department chair	Discussion and approval at faculty meeting of civil & environmental engineering
2/9/2011	James Mihelcic	Finalize program proposal for submittal
2/17/2011	College of Engineering Department Chairs and Graduate Coordinators	No objections received from College of Engineering. Message forwarded to Dr. Mihelcic by Associate Dean Perez.
2/18/2011	James Mihelcic, USF Associate Vice President, Diversity and Equal Opportunity, USF Dean of Libraries	Approval obtained from USF Associate Vice President, Diversity and Equal Opportunity & USF Dean of Libraries
2/28/2011	James Mihelcic, USF Graduate School (Dean Karen Liller and Carol Hines-Cobb), USF College of Engineering Rep (Associate Dean Rafael Perez), and CEE Graduate Director (Sarina Ergas)	Meeting between representatives of the Department of Civil & Environmental Engineering, College of Engineering, and Graduate School to discuss current draft of the proposal
3/2/2011	James Mihelcic, Jennifer Collins Graduate Director, USF Department	Jennifer Collins informed Dr. Mihelcic that her graduate committee which represents the Department of Geography,

	of Geography, Environment, and Planning	Environment, and Planning had met to discuss the proposal. She informed him that her department was supportive of the proposal.
5/22/2011	Amy Childress, Chair, Civil & Environmental Engineering, University of Nevada-Reno	Outside review of proposal provided to USF.
6/27/2011	James Mihelcic and ACE Advisory Council	Comments provided by ACE Advisory Council and incorporated into proposal.

Table. Events leading to Implementation of the Proposal.

Fall, 2010	Program planning and development
February 23, 2011	Graduate School Review
March 23, 2011	Submission to Tampa Graduate Council
April 4, 2011	Tampa Curriculum Committee
April 18, 2011	Tampa Graduate Council Meeting
April 25, 2011	Review by the ACE Workgroup
May 22, 2011	Outside review received
June 27, 2011	Discussed at ACE-AC meeting
August 5, 2011	ACE Meeting
August 18, 2011	Board of Trustees/ACE Work Group
October 6, 2011	Board of Trustees Meeting
November 9-10, 2011	Board of Governors Meeting

Program Quality Indicators - Reviews and Accreditation

A. Identify program reviews, accreditation visits, or internal reviews for any university degree programs related to the proposed program, especially any within the same academic unit. List all recommendations and summarize the institution's progress in implementing the recommendations.

The Department of Civil and Environmental Engineering manages a BS Civil Engineering degree that is accredited by the Accreditation Board for Engineering and Technology (ABET). Doctoral graduate engineering programs are not accredited by ABET.

The Civil & Environmental Engineering graduate programs were reviewed by two outside academic reviewers during a site visit on January 24, 2011. The reviewers are faculty members at Purdue University and Georgia Tech respectively. A self study report was prepared before the visit (Self-Study Report: Graduate Programs in Civil Engineering and Environmental Engineering, (10/28/10)).

Recommendations made by the two outside reviewers specifically relevant to this proposal include:

- 1) Improving recruitment of graduate students through interaction of our graduate program with national and international communities. (The recruitment strategy has been addressed above in Section II.E);
- 2) In regards to space, the physical separation of graduate students has created problems in building a strong community of scholars. This item is addressed in Section X.B because laboratory and graduate student office space will be increased by approximately 5,300 square feet as additional laboratory space is being developed on the first floor of the Interdisciplinary Science building. This plan will have an open floor plan and 28 additional office spaces for doctoral students and postdoctoral research associates.

3) Curriculum

A. Describe the specific expected student learning outcomes associated with the proposed program. If a bachelor's degree program, include a web link to the Academic Learning Compact or include the document itself as an appendix.

The primary goal of the PhD Environmental Engineering is to allow students to perform specialized training and research, which will result in the award of a doctoral degree that recognizes the student's scholarly competence and ability to conduct and report original and significant environmental engineering research. Ph.D. students may work in one or more of the following specialty areas of Environmental Engineering.

- Water Quality Engineering
- Air Quality Engineering
- Fate and Transport of Contaminants in the Environment
- Waste Management
- Sustainable Design and Sustainable Engineering
- Environmental Biotechnology Applied to Environmental Problems

PhD Graduate Student Outcomes

- Outcome 1. The student has demonstrated competency in the following core fundamentals (physical chemical principles, biological principles, aquatic chemistry, and sustainability) how these core fundamentals can be applied to environmental engineering research and practice.
- Outcome 2. The student has written a dissertation in one of the specialty areas of environmental engineering that presents defensible conclusions drawn from verifiable evidence.
- Outcome 3. The student has written, and had accepted, a minimum of 1 scholarly technical paper to a refereed journal or conference in the area of environmental engineering. The peer reviews indicate that the quality of the research is suitable for publication.
- Outcome 4. The student will demonstrate an ability to formulate and solve complex environmental engineering problems using relevant data and techniques.

Core Competency Learning Objectives

- Estimate quantitatively the distribution of chemicals between environmental phases or compartments
- Identify the most important chemical properties and environmental characteristics that govern how a chemical behaves in the environment and engineered systems
- Assess qualitatively how chemicals in environmental systems will respond to a state of chemical non-equilibrium
- Understand aqueous chemical equilibrium and solve quantitative problems that involve: acid-base equilibrium, heterogeneous equilibria, coordination chemistry, redox reactions, and surface chemistry
- Comprehend literature covering chemical equilibria as it relates to water chemistry of natural and engineered systems
- Understand fundamentals of microbial physiology and metabolism and relationship to engineering design and operation of engineered systems
- Learn to apply current methods of biotechnology to understand engineered bioprocesses as they apply to the fate, transport, and treatment of environmental pollutants, as well as production of renewable bio-based energy.
- Apply engineering fundamentals and principles of sustainable development and green engineering (e.g., life cycle assessment) in the design, construction, operation, and maintenance of engineering projects
- incorporate environmental, societal, and economic considerations and community participation into engineering practice as applied to protection of human health and the environment

B. Describe the admission standards and graduation requirements for the program.**Admission Standards**

GPA within major of ≥ 3.3 ; Overall GPA of ≥ 3.0

GRE: Verbal ≥ 450 , Quantitative ≥ 700 ; Analytical ≥ 4.0

International students must also meet the University's English Language requirements through the TOEFL (> 79) or GRE (> 500 verbal) exams. All students are also required to submit a resume, statement of purpose, and a minimum of two letters of reference. These materials are all reviewed by the graduate admissions committee prior to admission to the program. In addition, doctoral students must be accepted into a research group with a Dissertation advisor in their research area of interest.

Application Deadlines:

Fall admission: February 15; Spring admission: October 15.

Graduate Requirements

The doctoral degree is granted in recognition of high attainment in a specific field of knowledge. It is a research degree and is not conferred solely upon the earning of credit, the completion of courses, or the acquiring of a number of terms of residency, but also the successful completion of scholarly work. The degree will be granted after the student has shown proficiency and distinctive achievement in a specified field, has demonstrated the ability to do original, independent investigation, and has presented these findings with a high degree of literary skill in a dissertation. The Doctoral dissertation committee will consist of at least five members, two of whom must come from the department of Civil and Environmental Engineering, one of whom must be a member of the College of Engineering outside the department of Civil and Environmental Engineering, and one of whom must be outside the College of Engineering. Dissertation committee members must be members of the graduate faculty or be approved by the department, college and graduate school to serve on the committee.

Components of Research Dissertation Considered:

The review of related research and literature is clearly related to the problem statement and research topic. The literature reviewed is sufficient (i.e., there is no missing literature). The content of the review is drawn from acceptable peer-reviewed journals. The review presents a clear understanding of the problem and provides a rationale for the research objectives and approach.

The research design follows logically from the research question. The process by which the data was generated, gathered, recorded and analyzed is appropriate and clearly described. For theoretical projects, a sound analysis including model development, calibration and verification is provided.

The research findings build logically from the problem and the research design, and are presented in a manner that addresses the research questions. All salient data and/or model results are accounted for in the findings. The findings are significant (i.e., high impact) to the field. The interpretations and conclusions are justified by the results.

PhD Graduate Student Outcomes

- Outcome 1. The student has demonstrated competency in the following core fundamentals (physical chemical principles, biological principles, aquatic chemistry, and sustainability) how these core fundamentals can be applied to environmental engineering research and practice.

- Outcome 2. The student has written a dissertation in one of the specialty areas of environmental engineering that presents defensible conclusions drawn from verifiable evidence.
- Outcome 3. The student has written, and had accepted, a minimum of 1 scholarly technical paper to a refereed journal or conference in the area of environmental engineering. The peer reviews indicate that the quality of the research is suitable for publication.
- Outcome 4. The student will demonstrate an ability to formulate and solve complex environmental engineering problems using relevant data and techniques.

PhD Program Graduation Requirements

Total Minimum Hours: 78 (beyond the baccalaureate degree) or **48** (beyond the Master's degree)²⁴

Core Requirements

- A minimum of 48 hours coursework are required (excluding directed research and graduate instruction methods) that can include a maximum of 9 hours of independent study. A minimum 15 hours of coursework are required within the area of concentration that includes 4 core courses (no credits of directed research or graduate instruction methods may be used to meet this requirement).
- Minimum of 20 hours of dissertation research²⁵
- 10 additional hours of additional coursework, independent study, directed research, dissertation research, or graduate instruction methods

Dissertation Requirements: A minimum of 20 hours of dissertation are required.

Additional Requirements:

- Students will submit and defend a research proposal detailing their planned dissertation research. Normally this is done within four semesters of entrance into the program.
- Students are required to write and submit a scholarly technical paper to a refereed journal or conference. The peer reviews must indicate that the quality of the paper is suitable for publication.

Core Courses (all doctoral students in environmental engineering are required to show competency in the following subjects from a previous degree or coursework taken at USF)

ENV 6002 Physical Chemical Principles (3 credits)

EES 6107 Biological Principles (3 credits)

ENV 6666 Aquatic Chemistry (3 credits)

One sustainability course [e.g., CGN 6933 Green Engineering for Sustainability (3 credits) *or* CGN 6933 Green Infrastructure for Sustainable Communities (3 credits) *or* CGN 6933 Sustainable Development Engineering (3 credits)]

C. Describe the curricular framework for the proposed program, including number of credit hours and composition of required core courses, restricted electives, unrestricted electives, thesis requirements, and dissertation requirements. Identify the total numbers of semester credit hours for the degree.

PhD Program Requirements for students with a baccalaureate degree)

Total Minimum Hours: 78 (beyond the baccalaureate degree)²⁶

²⁴ Further requirements may be imposed by the candidate's supervisory committee

²⁵ Dissertation hours will be taken with the major advisor(s) regardless of their specific department affiliation

²⁶ Further requirements may be imposed by the candidate's supervisory committee

Core Requirements

- A minimum of 48 hours coursework are required (excluding directed research and graduate instruction methods) that can include a maximum of 9 hours of independent study. A minimum 15 hours of coursework are required within the area of concentration that includes 4 core courses (no credits of directed research or graduate instruction methods may be used to meet this requirement).
- Minimum of 20 hours of dissertation research²⁷
- 10 additional hours of additional coursework, independent study, directed research, dissertation research, or graduate instruction methods

Dissertation Requirements: A minimum of 20 hours of dissertation are required.

Additional Requirements:

- Students will submit and defend a research proposal detailing their planned dissertation research. Normally this is done within four semesters of entrance into the program.
- Students are required to write and submit a scholarly technical paper to a refereed journal or conference. The peer reviews must indicate that the quality of the paper is suitable for publication.

Core Courses (all doctoral students are required to show competency in the following subjects from a previous degree or coursework taken at USF)

ENV 6002 Physical Chemical Principles (3 credits)

EES 6107 Biological Principles (3 credits)

ENV 6666 Aquatic Chemistry (3 credits)

One sustainability course [e.g., CGN 6933 Green Engineering for Sustainability (3 credits) *or* CGN 6933 Green Infrastructure for Sustainable Communities (3 credits) *or* CGN 6933 Sustainable Development Engineering (3 credits)]

PhD Program Requirements for students with a Master's degree)

Total Minimum Hours: 48 (beyond the baccalaureate degree)²⁸

Core Requirements

- A minimum of 18 hours coursework are required (excluding directed research and graduate instruction methods) that can include a maximum of 9 hours of independent study. (no credits of directed research or graduate instruction methods may be used to meet this requirement).
- Minimum of 20 hours of dissertation research²⁹
- 10 additional hours of additional coursework, independent study, directed research, dissertation research, or graduate instruction methods

Dissertation Requirements: A minimum of 20 hours of dissertation are required.

Additional Requirements:

- Students will submit and defend a research proposal detailing their planned dissertation research. Normally this is done within four semesters of entrance into the program.
- Students are required to write and submit a scholarly technical paper to a refereed journal or conference. The peer reviews must indicate that the quality of the paper is suitable for publication.

²⁷ Dissertation hours will be taken with the major advisor(s) regardless of their specific department affiliation

²⁸ Further requirements may be imposed by the candidate's supervisory committee

²⁹ Dissertation hours will be taken with the major advisor(s) regardless of their specific department affiliation

Core Courses (all doctoral students are required to show competency in the following subjects from a previous degree or coursework taken at USF)

ENV 6002 Physical Chemical Principles (3 credits)

EES 6107 Biological Principles (3 credits)

ENV 6666 Aquatic Chemistry (3 credits)

One sustainability course [e.g., CGN 6933 Green Engineering for Sustainability (3 credits) *or* CGN 6933 Green Infrastructure for Sustainable Communities (3 credits) *or* CGN 6933 Sustainable Development Engineering (3 credits)]

D. Provide a sequenced course of study for all majors, concentrations, or areas of emphasis within the proposed program.

The time for degree is expected to be three to five years, depending on whether a student has a M.S. degree or not. Incoming students will typically take a course load of approximately 3 courses per semester for their first academic year (range of two to four courses). The four required core courses follow the sequence as shown above. Core requirements can be completed in one academic year. Students will transition to more research credits and less course credits as they advance through the program. It is expected that incoming doctoral students will defend a research proposal and advance to candidacy within two years of enrollment.

E. Provide a one- or two-sentence description of each required or elective course.

Four Required Core Courses

ENV 6002 Physical Chemical Principles (3 credits) *Investigates how chemical properties, physical processes, and environmental characteristics all influence the fate and transport of chemicals in natural and engineered systems. Includes theory, practical examples, and laboratory experiments.*

EES 6107 Biological Principles (3 credits) *This course improves the student's knowledge and problem solving skills with respect to the Biological Principles used by Environmental Engineers to design biological processes. Students will learn about microbial physiology and metabolism, and current methods used to understand bioprocesses.*

ENV 6666 Aquatic Chemistry (3 credits) *An introduction to the form, structure, and chemical activities of the important processes essential to treatment of domestic and industrial wastewater.*

Sustainability course (students must take one of the following three courses)

CGN 6933 Green Engineering for Sustainability (3 credits) *This course will provide a foundation for green engineering design. Concerns regarding population growth, global warming, resource scarcity, globalization, and environmental degradation have led to an increasing awareness that current engineering design and policy strategies can be engaged more effectively to advance the goal of sustainability. Approaching sustainability from a design perspective requires the need for a fundamental conceptual shift from the current paradigms of product toward a more sustainable system based on efficient and effective use of benign materials and energy.*

CGN 6933 Sustainable Development Engineering (3 credits) *Study of applying appropriate and sustainable engineering solutions and technology to control environmental pollutants found in a developing world setting and smaller communities in North America. Concepts of sustainable development are covered. Topics are drawn from several areas of engineering, including water supply, water treatment, water storage, wastewater treatment, materials, solid waste management, construction, and watersheds.*

CGN 6933 Green Infrastructure for Sustainable Communities (3 credits) *Develops core understanding of green design, sustainability principles and infrastructure management. Using the US Green Building Council's Leadership in Energy and Environmental Design (LEED) rating system as a framework, students will learn integrated approaches for smart management of resources and components (e.g., water, energy, sites, transportation, habitat, materials and indoor quality) in the built environment.*

Elective Courses (related to environmental engineering) offered in Civil & Environmental Engineering

ENV5103 Air Pollution Control *Behavior and effects of atmospheric contaminants and the principles of making measurements in the air environment. Basic concepts of meteorology and control technology are discussed. Regulatory aspects and air pollution standards are covered.*

ENV5334 Hazardous Waste Management and Remedial Action (3 credits) *Introduction to hazardous waste management and remediation: RCRA regulatory concepts, definitions, aspects of hazardous waste management from within the plant to final disposal.*

ENV5345 Solid Waste Control (3 credits) *Introduction to solid waste management, including its definition as an umbrella for hazardous waste: regulatory concepts; waste types, quantities, and characterization; collection and recycling; facility siting; disposal; thermal treatment.*

ENV 6105. Air Pollution (3 credits) *A survey of air pollution fundamentals, including physics/chemistry of air pollution, sources and emissions estimation, Gaussian dispersion models, exposures and effects, measurement/monitoring, and management/control.*

ENV6438 Natural & Small Scale Treatment Systems (3 credits) *A study of the theory, analysis and design of natural aquatic systems to treat wastewater. Emphasis is on use of treated and partially treated wastewater or residues to enhance, restore, or create wetlands, as well as land application.*

ENV6614 Quantitative Environmental Risk Analysis (3 credits) *Quantitative approach to the determination of risk. Focus is on environmental and control and protection, but techniques apply widely. Covers assessment of risk factors, failure, contaminant transport, and health effects. Includes discussion of significance, implementation, and policy. Course project involves the development of small risk analysis model.*

ENV 6519 Physical and Chemical Processes in Environmental Engineering (3 credits) *Theory and design of processes used in advanced water and wastewater treatment, including membrane processes, absorption, electrodialysis, ozonation, irradiation.*

ENV6667 Environmental Biotechnology (3 credits) *Study of principles and applications of environmental biotechnology pertaining primarily to biological wastewater treatment and bioremediation. Under principles, we will review the basics of microbiology and cover topics such as electron and oxygen equivalents, stoichiometry, energetics and kinetics of microbial growth, substrate degradation kinetics, suspended- and attached-growth systems, bioreactor concepts for completely-mixed and plug flow systems. Under applications, we will cover treatment processes relevant to environmental engineering, such as lagoons and ponds, activated sludge, biological nutrient removal, membrane bioreactors, trickling filters and rotating biological contactors, fluidized bed reactors, and anaerobic digestion.*

CGN 6933 Seminar in Environmental & Water Resources Engineering (1 credit). *Students will develop a breadth of exposure to topics in environmental and water resources engineering and become familiar with up-to-date approaches to solving environmental and water resources problems.*

CGN 6933 Special topics in Civil and Environmental Engineering (credits variable) (topics include Transport in Porous Media, Community Air Pollution, Environmental Modeling, Groundwater Engineering, Molecular Biology in Engineering, and Air Quality for Environmental & Transportation Engineers and Membrane Technologies for Environmental Engineering)

CGN6941 Graduate Instruction Methods (3 credits) *Special course to be used primarily for the training of graduate teaching assistants.*

CGN 6209 Hydrodynamic Modeling (3 credits) *St. Venant Equations for unsteady flow in open channels; implicit and explicit solution techniques. The use of hydrodynamic modeling for storm water planning and design. Transport-diffusion equations and finite difference solutions.*

CWR 6305 Urban Hydrology (3 credits) *A study of the quantity and quality problems and solution techniques associated with urban runoff.*

CWR 6533 Water Quality Modeling (3 credits) *This course will develop the fundamental principals and concepts of water quality modeling and apply water quality models in a variety of contexts. The mathematical representations of environmental transport and transformation processes will be elucidated. Models of different complexity will be applied to a variety of environmental contexts.*

CWR 6534 Coast and Estuary Modeling (3 credits) *Digital modeling of coastal and estuary systems, currents, tide heights, sediment transport, erosion, data collection, temperature distribution, sources and sinks. Special emphasis on Florida regions.*

CWR 6535 Hydrologic Models (3 credits) *A study of the theoretical principles of hydrologic modeling and an examination of various numerical hydrologic models available. Students will be required to develop and apply computer models.*

CWR 6538 Advanced Hydrologic Models (3 credits) *Present the theoretical and applied concepts of advanced hydrologic modeling and especially integrated surface water/ground water modeling and to examine various numerical hydrologic models used in engineering practice.*

F. For degree programs in the science and technology disciplines, discuss how industry driven competencies were identified and incorporated into the curriculum and identify if any industry advisory council exists to provide input for curriculum development and student assessment.

The four required core courses described previously for this doctoral environmental engineering degree are deemed by those in practice as knowledge and core competencies important for the understanding and practice of environmental engineering as described in the Environmental Engineering Body of Knowledge (EnvE BOK)³⁰ (American Academy of Environmental Engineers). This knowledge and core competencies includes: 1) enabling knowledge such as sustainability, 2) skills outcomes such as advanced knowledge and skills essential for professional practice of environmental engineering, and 3) several of the knowledge domains identified as specific areas of essential learning. The skills essential for professional practice in environmental engineering are defined as requiring students in this program to demonstrate competency in the following core fundamentals

³⁰ The Environmental Engineering Body of Knowledge describes the knowledge and core competencies important for the understanding and practice of environmental engineering. It builds on ABET outcomes applicable to all engineering specialties by adding outcomes specific and unique to environmental engineering.

(physical chemical principles, biological principles, aquatic chemistry, and sustainability) and how these core fundamentals can be applied to environmental engineering research and practice.

The Department of Civil & Environmental Engineering has established an outside advisory board that consists of up to eight outside members from engineering practice, research, and academics. These individuals provide input on the undergraduate and graduate programs offered through the department. These advisory board members are available to provide input to curriculum development and student assessment.

G. For all programs, list the specialized accreditation agencies and learned societies that would be concerned with the proposed program. Will the university seek accreditation for the program if it is available? If not, why? Provide a brief timeline for seeking accreditation, if appropriate.

There is no specialized accreditation for doctoral programs in Engineering.

H. For doctoral programs, list the accreditation agencies and learned societies that would be concerned with corresponding bachelor's or master's programs associated with the proposed program. Are the programs accredited? If not, why?

The Department of Civil and Environmental Engineering offers a BS Civil Engineering degree that is accredited by the Accreditation Board for Engineering and Technology (ABET).

I. Briefly describe the anticipated delivery system for the proposed program (e.g., traditional delivery on main campus; traditional delivery at branch campuses or centers; or nontraditional delivery such as distance or distributed learning, self-paced instruction, or external degree programs). If the proposed delivery system will require specialized services or greater than normal financial support, include projected costs in Table 2. Provide a narrative describing the feasibility of delivering the proposed program through collaboration with other universities, both public and private. Cite specific queries made of other institutions with respect to shared courses, distance/distributed learning technologies, and joint-use facilities for research or internships.

The program will primarily be delivered through traditional on-campus methods on the main Tampa campus. However, some students may take the opportunity to take classes off campus because several graduate courses are offered through distance learning at USF or by other universities. In addition, research can be conducted in research laboratories and centers located off campus with approval of the student's graduate advisor and committee.

IX. Faculty Participation

A. Use Table 4 to identify existing and anticipated ranked (not visiting or adjunct) faculty who will participate in the proposed program through Year 5. Include (a) faculty code associated with the source of funding for the position; (b) name; (c) highest degree held; (d) academic discipline or specialization; (e) contract status (tenure, tenure-earning, or multi-year annual [MYA]); (f) contract length in months; and (g) percent of annual effort that will be directed toward the proposed program (instruction, advising, supervising internships and practice, and supervising thesis or dissertation hours).

See Table 4

b. Use Table 2 to display the costs and associated funding resources for existing and anticipated ranked faculty (as identified in Table 2). Costs for visiting and adjunct faculty should be included in the category of Other Personnel Services (OPS). Provide a narrative summarizing projected costs and funding sources.

See Table 2

C. Provide the number of master's theses and/or doctoral dissertations directed, and the number and type of professional publications for each existing faculty member (do not include information for visiting or adjunct faculty).

Table. Faculty and associated theses/dissertations directed and number of professional publications.

Faculty Name	Number of M.S. theses completed to graduation (and number currently advised)	Number of doctoral dissertations completed to graduation (and number currently advised)	Professional Publications Including all Peer-Reviewed and Others
Jeffrey Cunningham	4 (2)	3 (2)	57
Sarina Ergas	17(7)	4 (4)	69 plus 1 textbook
James R. Mihelcic	77 (21)	9 (6)	105 plus 3 textbooks
Peter Stroot	0 (0)	0 (3)	28
Amy Stuart*	11 (3)	0 (3)	45
Maya Trotz	2 (2)	3 (5)	22
Daniel Yeh	5 (5)	0 (8)	33
Qiong Zhang	5 (3)	2 (4)	30

Dr. Stuart is a faculty member in the Department of Environmental & Occupational Health with a courtesy appointment in Civil & Environmental Engineering.

D. Provide evidence that the academic unit(s) associated with this new degree have been productive in teaching, research, and service. Such evidence may include trends over time for average course load, FTE productivity, student HC in major or service courses, degrees granted, external funding attracted, and qualitative indicators of excellence.

The academic units affiliated with this degree have been very productive and interdisciplinary. Core and elective environmental engineering graduate course enrollment has grown in the past five years from under 20 students to 25-40 students per offering. The department graduate roster from November 2010 showed that the number of graduate students advised by environmental engineering faculty had grown to 33 PhD and 42 MS thesis students. The environmental engineering faculty are also involved in national service as shown in the Table below.

Grant award (on a dollar per faculty basis) in the department has ranged from \$80,000 to \$170,000 over the past ten years. Example of current funded research within the environmental engineering faculty group exceeds \$3.78 million dollars and includes: 1) US Department of Education Doctoral Graduate Fellowship Program at the Water-Energy-Materials-Human Nexus (\$783,936); 2) NSF Graduate Scholarships to Achieve Sustainable Infrastructure at the Water/Energy Nexus (\$600,000); 3) NSF Career Award on Multi-scale interactions of air

pollution, urban growth, and equity – integrated research methods and informal science teaching (\$400,000); 4) NSF Tampa Interdisciplinary Environmental Research (\$300,000); 5) NSF MUSES grant for Modeling and Analyzing the Use, Efficiency, Value and Governance of Water as a Material (\$298,531); 6) Norwegian Research Council grant to develop a Sustainable Process to Capture and Store CO₂ to Increase Production of Biorenewable Energy (\$274,000); 7) NSF OISE grants bring students to Bolivia to research Sustainable Water Management (\$149,969) and to the UNESCO IHE laboratory in Delft (Netherlands) to research Sustainable Clean Water Technologies for the UN’s Millennium Development Goals (\$149,937); 8) Water Reuse Foundation Grant to Review Models to Estimate the Carbon Footprint of Water Reuse and Desalination Facilities (\$25,000), and 9) a US Green Building Council grant for research on Integrated Building Water Management Modeling (\$149,525).

Table. Examples of the engagement of environmental engineering faculty members in national service

Faculty	Example of National Service
Dr. J. Cunningham	<ul style="list-style-type: none"> • Co-Chair, Association of Environmental Engineering and Science Professors (AEESP) 2011 National Conference (4/2010 – present). • Member, AEESP Thesis Award Committee (2008-2009)
Dr. S. Ergas	<ul style="list-style-type: none"> • Member, Research Symposium Committee, Water Environmental Federation • Chair Lectures Committee, Association of Environmental Engineering and Science Professors • Board Member, Membrane Specialist Group, International Water Assoc. • Board Member, Association of Environmental Engineering & Science Professors
Dr. J. Mihelcic	<ul style="list-style-type: none"> • Member, Environmental Protection Agency Science Advisory Board, Environmental Engineering Committee • Member, Environmental Protection Agency Chartered Science Advisory Board, • Board Trustee, American Academy of Environmental Engineers (AAEE) • Past President and Board Member, Association of Environmental Engineering & Science Professors (AEESP)
Dr. A. Stuart	<ul style="list-style-type: none"> • Vice Chair, Local Technical Committee for the 2011 Annual Meeting, Air & Waste Management Association (Fall 2009)
Dr. P. Stroot	<ul style="list-style-type: none"> • Faculty Advisor for Florida Water Environment Association
Dr. M. Trotz	<ul style="list-style-type: none"> • Co-Chair, Association of Environmental Engineering and Science Professors (AEESP) 2011 National Conference (4/2010 – present). • Youth Committee Chair, Caribbean Diaspora for Science, Technology and Innovation (CADSTI) (9/2008 – present). • Invited Observer, United Nations Secretary General’s Advisory Board on Water and Sanitation (Bogota, Colombia, 2007 and Tokyo, Japan, 2008).
Dr. D. Yeh	<ul style="list-style-type: none"> • Member, Industrial Wastes Committee, Water Environment Federation • Co-Chair, National Water Pollution Committee, American Society of Civil Engineers Environment Water Research Institute (ASCE/EWRI) • Core Committee Member, Water Efficiency Technical Advisory Group (WE-TAG), US Green Building Council
Dr. Q. Zhang	<ul style="list-style-type: none"> • Developed and delivered two workshops at national conferences for American Society of Engineering Education (ASEE) and Association of Environmental Engineering and Science Professors (AEESP) to disseminate the learning suites developed to incorporate sustainability into the engineering education.

X. Non-Faculty Resources

A. Describe library resources currently available to implement and/or sustain the proposed program through Year 5. Provide the total number of volumes and serials available in this discipline and related fields. List major journals that are available to the university's students. Include a signed statement from the Library Director that this subsection and subsection B have been reviewed and approved for all doctoral level proposals.

Overview of USF Libraries, Mission, and Program/Discipline Strengths

The University of South Florida is accredited by the Commission on Colleges of the Southern Association of Colleges and Schools to award degrees at the baccalaureate, master's, specialist, and doctoral levels, including the Doctor of Medicine. The institution was initially accredited in 1965 and was last reviewed and reaffirmed in 2005. The institution is scheduled to receive its next reaffirmation of accreditation review in 2015.

The University of South Florida's Library System consists of USF's main research library, located on the Tampa Campus; two special libraries, the Hinks and Elaine Shimberg Health Sciences Library and the Louis de la Parte Mental Health Institute Library, which are also located on the Tampa Campus; the Nelson Poynter Memorial Library, USF St. Petersburg; the Jane Bancroft Cook Library, USF Sarasota-Manatee; and the USF Polytechnic Library in Lakeland. Our vision is to become a globally recognized academic library system advancing knowledge through integrated resources, responsive services, research, and instruction. Together, the USF Libraries provide access to more than 2 million volumes and an extensive collection of electronic resources including approximately 6,500 e-journal subscriptions and 800 aggregator databases containing another 53,000 unique e-journal titles, 443,000 e-books, and 826,000 digital images. In addition, students have access to over 45,000 audio/visual materials including videos, CDs, and DVDs.

In addition to extensive electronic and print resources, the USF Libraries offer unique access to primary research materials through the Special and Digitized Collections Department. Specializations include: Holocaust & Genocide Studies, Science Fiction, Oral Histories, Florida Studies, Sacred Leaves medieval manuscripts, literature and book arts, children and young adult literature, sheet music, and rare books. Most special collections are available at the USF Tampa Library.

The library endeavors to develop and maintain a collection that will satisfy the needs for resources that support the undergraduate and graduate curriculum in Environmental Engineering, as well as serve the more specialized demands from graduate students and faculty for advanced research materials.

In addition to the Bachelor of Science in Civil and Environmental Engineering, the Civil and Environmental Engineering Department offers programs at both the master's and Ph.D. levels. Details of undergraduate degree programs include the current list of undergraduate Department Specializations and primary research thrusts: Geotechnical & Geoenvironmental Engineering, Structural & Materials Engineering, Transportation Systems, and Water Resources & Environmental Systems. The details for graduate degree programs, including Coursework Master's Degrees, Thesis Master's Degrees, and Doctoral Degrees are also available online.

Adding a distinct PhD in Environmental Engineering degree more accurately reflect the increased research focus, both at USF and at the national level, and will allow for more accurate comparisons to peer institutions across the country.

USF Libraries' Collections

The library collects current research materials in many subject areas within the Library of Congress subject classifications relating to general, civil, and environmental engineering topics in the call number areas TA1-2040. Library of Congress call number areas for the some of the more specific subject areas, including Hydrology – Water, Engineering (General), Environmental Engineering, Hydraulic Engineering, Environmental Technology, and Water Supply for Domestic and Industrial purposes, are:

▪ Hydrology. Water	GB651-2998
▪ Environmental Sciences	GE1-350
▪ Engineering (General)	TA1-2040
▪ Environmental Engineering	TA170-171
▪ Hydraulic Engineering	TC1-798
▪ Environmental Technology	TD1-1066
▪ Water Supply for Domestic and Industrial purposes	TD201-500

The number of monographs for the above subject areas*

Print: 15,516
Electronic: 2,394

The number of serials for the above subject areas*

Print: 769
Electronic: 756

* Numbers compiled using *WorldCat Collection Analysis Tool*

eBook Collections include: Springer eBook collection in Engineering, Springer eBooks in Earth and Environmental Sciences, Elsevier, Annual Reviews, NetLibrary, Ebrary, and Referex.

Online journals in the research fields of Environmental Engineering include the following subject areas: Environmental Pollution, Environmental Protection, Environmental Technology, Water; General, Groundwater, Global Sustainability (including Environmental Policy & Economic Development, Sustainable Development), Hydrology, and Public Health.

Notable online journals*, owned by the USF Libraries (and associated impact factor's) include: *Applied Catalysis B – Environmental* (5.252), *Environmental Science & Technology* (4.630), *Water Research* (4.355), *Journal of Hazardous Materials* (4.144), *International Journal of Greenhouse Gas Control* (3.644), *Environmental Modelling & Software* (3.085), *Indoor Air* (2.891), *Ecological Engineering* (2.745), *International Journal of Life Cycle Assessment* (2.636), *Ambio* (2.486), *Waste Management* (2.433), *Environmental Chemistry Letters* (2.109), *Resources Conservation and Recycling* (1.987), *Journal of Cleaner Production* (1.867), *Building and Environment* (1.797), *Journal of the Air & Waste Management Association* (1.670), *Environmental Geochemistry and Health* (1.622), *Journal of the American Water Resources Association* (1.618), *Journal of Polymers and the Environment* (1.571), *Stochastic Environmental Research and Risk Assessment* (1.419).

* Top Twenty Journals in Engineering, Environmental with ISI Impact Factors – 2009 JCR Journal Citation Reports – Science Edition.

EJournal Packages include: SpringerLink, Science Direct, Wiley Online Library, JSTOR General Science, IEEE Xplore, GeoScienceWorld, OVID, SAGE Journals Online, and others.

Subject *	Books	eBooks	Total Books	Journals	eJournals	Total Journals
Biology	25,324	2,564	27,888	767	1,300	2,067
Chemistry	8,449	914	9,363	283	419	702
Engineering	50,884	8,072	58,956	3,047	2,781	5,828
Geography & Earth Sciences	18,435	2,202	20,637	893	739	1,632
Mathematics & Statistics	22,967	3,210	26,177	509	628	1,137
Public Health	10,577	902	11,479	4,944	2,164	7,108

*

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Numbers compiled using *WorldCat Collection Analysis Tool*

Number of Electronic Databases in Environmental Engineering - There are over 30 existing databases that directly cover topics in Environmental Engineering, including:

[Applied science & technology full text](#)

ASTA indexes the latest findings in every area of science, engineering, and technology covering trade and industrial publications, journal issues by professional and technical societies, and specialized subject periodicals.

[ASCE research library](#)

The ASCE research library is a comprehensive online tool for locating articles of interest across all disciplines of civil engineering. It provides access to more than 18,500 full-text papers from thirty ASCE journals and over 75 conference proceedings.

[Civil engineering abstracts](#)

Indexes and abstracts approximately 3000 serial titles as well as numerous non-serial publications in civil engineering and its complementary fields, including forensic engineering, management and marketing of engineering services, engineering education, theoretical mechanics and dynamics, and other related fields.

[Compendex \(1884- \) \(Engineering Village\)](#)

Compendex on the Engineering village 2 platform is the most comprehensive bibliographic database of engineering research available today, containing over ten million references and abstracts taken from over 5,000 engineering journals, conferences and technical reports.

[Corrosion abstracts](#)

Corrosion Abstracts provides the world's most complete source of bibliographic information in the area of corrosion science and engineering. International sources of literature are scanned and abstracted in the areas of general corrosion, testing, corrosion characteristics, and preventive measures.

[EIS, digests of environmental impact statements](#)

The federal government issues hundreds of environmental impact statements each year and this one resource provides detailed abstracts of all of those statements, also indexing them for easy reference. EIS extracts the key issues from complex government-released environmental impact statements.

[Environmental engineering abstracts](#)

Environmental engineering abstracts covers the world literature pertaining to technological and engineering aspects of air and water quality, environmental safety, and energy production. More than 700 primary journals are thoroughly indexed and abstracted. Over 2,500 additional sources are also indexed.

[Environmental sciences & pollution management](#)

This multidisciplinary database, provides unparalleled and comprehensive coverage of the environmental sciences. Abstracts and citations are drawn from over 4000 scientific journals and thousands of other sources including conference proceedings, reports, monographs, books and government documents.

[Health and safety science abstracts](#)

This database covers the latest perspectives on topics of widespread concern such as aviation and aerospace safety, environmental safety, nuclear safety, medical safety occupational safety, and ergonomics.

[IEEE Xplore](#)

Provides full-text access to IEEE transactions, IEEE and IEE journals, magazines, and conference proceedings published since 1988, and all current IEEE standards; brings additional search and access features to IEEE/IEE electronic library users.

[International critical tables of numerical data, physics, chemistry, and technology](#)

This classic and well-known reference was originally published for the National Research Council in 7 volumes. It contains an enormous amount of critical data on inorganic and organic compounds, and pure substances.

[National Technical Information Service](#)

The National Technical Information Service is the federal government's central source for the sale of scientific, technical, engineering, and related business information produced by or for the U.S. government and complementary material from international sources.

[Pollution abstracts](#)

This database provides fast access to the environmental information necessary to resolve day-to-day problems, ensure ongoing compliance, and handle emergency situations more effectively. Pollution Abstracts combines information on scientific research and government policies in a single resource.

[Referex: Chemical, petrochemical and process engineering](#)

Referex: Chemical, petrochemical and process provides the leading titles in energy, chemical engineering, chemical hazards, process engineering, oil and gas engineering, and environmental engineering.

[Referex: Mechanical engineering and materials](#)

Referex: Mechanical engineering and materials is a collection of handbooks, professional resources, and practical guides covering automotive, aeronautical, and marine engineering, metallurgy, tribology, maintenance, quality systems, health and safety.

[Risk abstracts](#)

Risk abstracts encompasses risk arising from industrial, technological, environmental, and other sources, with an emphasis on assessment and management of risk. The journal includes occasional articles on topics of significant interest.

[Safety science & risk abstracts](#)

Bibliographic citations and abstracts across the fields of public health, safety, and industrial hygiene. Cited studies are geared to help researchers identify, evaluate, and eliminate or control risks and hazards from environmental and occupational situations. Major areas of coverage include: ...

[ScienceDirect](#)

A web database for scientific research that contains the full text of more than 1000 Elsevier Science journals in the life, physical, medical, technical, and social sciences available throughout the Internet. Contains abstracts and articles from the core journals in major scientific disciplines.

[SpringerLink](#)

Provides online access to full text of journals from the Springer Publishing Group.

[Toxicology abstracts](#)

This database covers issues from social poisons and substance abuse to natural toxins, from legislation and recommended standards to environmental issues. Major areas of subject coverage include: pharmaceuticals, food, additives, and contaminants, agro-chemicals, cosmetics, toiletries, and other related fields.

[TOXLINE](#)

This database covers the pharmacological, biochemical, physiological, and toxicological effects on drugs and

other chemicals. Major areas of subject coverage include: air pollution, antidotes, biological and adverse effects of drugs, carcinogenesis via chemicals, and chemically-induced diseases.

[TOXNET](#)

A cluster of databases on toxicology, hazardous chemicals, and related areas.

[Van Nostrand's scientific encyclopedia](#)

Originally published in 1938, and now in its ninth print edition, Van Nostrand's scientific encyclopedia (VNSE) has long held the reputation as one of the most authoritative and accessible general scientific references available.

[Water resources abstracts](#)

The database concentrates on water supply and water treatment; major areas of subject coverage include: groundwater, lakes, estuaries, erosion and sedimentation, water supply and conservation, desalination, water yield improvement, water quantity management and control, watershed protection, and other fields of water research.

[Web of science](#)

The ISI Web of Science provides seamless access to the Science Citation Expanded®, Social Sciences Citation Index®, and Arts & Humanities Citation Index™. It enables users to search current and retrospective multidisciplinary information from approximately 8,500 of the most prestigious, highly cited journals.

[Wiley Online Library](#)

Features over 1,000 journals, major reference works, online books, Current Protocols laboratory manuals, and databases as well as a suite of professional and management resources.

Related Databases – College of Engineering, the schools of Geography, Environment and Planning and Environmental Science and Policy, as well as the Natural Sciences & Mathematics (SNSM)

Due to its highly multidisciplinary nature, the resources utilized by students and faculty in the PhD Environmental Engineering program would be closely aligned with a number of other program and subject areas. In addition to overlap with other resources provided for the College of Engineering, there would also be heavy overlap with the emerging School of Global Sustainability, Global Change Science, and other emerging initiatives. The related disciplines included in these research clusters include: Geography, Geology, Environmental Science & Policy, Engineering, Chemistry, Biology, Medicine, Public Health, and Mathematics & Statistics.

In addition to the databases in the environmental and engineering sciences, the USF Libraries support this research focus by providing access to the following premier databases and journals in related science disciplines: **BIOSIS Previews** (Biology), **SciFinder Scholar** (Chemistry), **Ecology Abstracts** (ESP), **GeoRef** (Geology), **GEOBASE** (Geography), **MathSciNet** (Mathematics & Statistics), **Medline** (Medicine), **CINAHL** (Public Health), **IEEE Xplore** (Engineering), **ProQuest Dissertations & Theses** (full text).

Datasets, Maps & GIS

The USF Library is one of the founding partners of the Karst Information Portal (KIP), which is an open-access digital library linking scientists, managers, and explorers to a knowledge base of highly interdisciplinary research information on hydrology and karst environments. The USF Libraries have also established a central repository for unbiased information and data on the BP Deepwater Horizon oil spill in the Gulf of Mexico. The Gulf Oil Spill Information Center (GOSIC) provides access to the latest information on the Gulf oil spill, published research and grey literature on the topic. GOSIC has also laid the groundwork for formation of a repository for geospatial data associate with the oil spill. This geo-spatial portal will also provide other STEM (Science, Technology, Engineering, & Mathematics) disciplines, including topics related to environmental engineering, with a repository for the data sets needed to support their research.

Government Documents

The USF Tampa Library is a designated Federal Depository Library. The materials that are received from the Government Printing Office are selected based on the research needs of the university. The library routinely receives publications from the Department of Interior, the United States Geological Survey, the Environmental

Protection Agency and the Department of Agriculture, which include research surveys, technical reports, statistical data, and maps. In addition to recent publications, the library also maintains an historical collection of research materials in the natural sciences.

Expenditures

In any given year, the USF Libraries materials budget is pushed to its limit. The rising cost of continuing journal subscriptions, the need for new research materials, and requests for access to online data sets are part of the daily landscape. A large portion of the USF Libraries' \$6.2 million budget supports the continuation of the electronic resources. The biological sciences are well represented throughout the USF Libraries electronic collections. The USF Libraries recognize the need to continue their support for research and teaching within the STEM disciplines and have included several STEM initiatives in their strategic goals. The Karst Information Portal and the Gulf Oil Spill Information Center are more outward examples of the USF Libraries' commitment to science and technology. Another primary research area that has been identified is Global Change Science. The USF Library has also included Global Change Science as one of its strategic goals and is currently working on the development of collections in marine and freshwater ecological research to provide research support for the study of the effects of climate change on plant and animal habitats. These current expenditures support a large portion of the needs of students, faculty, and other researchers of this proposed new PhD in Environmental Engineering.

Summary Statement

Recognizing the value and importance of research in environmental engineering, the USF Libraries will continue a sustained level of support for doctoral research in this field, along with allied and associated subject areas and disciplines. Within the next five years, the expectation would be for a continued level of support for this discipline. An increase in the cost of the library's journal subscriptions would be anticipated with typical annual increases of 3-6 %. The acquisition of additional resources would have to be balanced against the research needs of other academic disciplines on campus within the confines of any budgetary restraints that the university could face during the next five years.

Matt Torrence

Title: Assistant Librarian, Academic Services

Date: February 15, 2011 Email: torrence@usf.edu

Reviewed by:

Cheryl McCoy, Coordinator of Collection Development, USF Libraries

Date: Email: cmccoy@usf.edu

Approved by:

Todd Chavez, Director of Academic Resources, USF Libraries

Date: Email: tchavez@usf.edu

As of February, 2011, the collections of the USF Tampa Library and affiliates are sufficient to support a PhD Environmental Engineering program and research endeavors. Sustained annual investments to maintain the recurring elements of this collection and to purchase newly published materials are required to preserve sufficiency. With escalating costs, typical annual increases of 3-6% are likely. Strategic investments are required as new faculty are hired and areas of emphasis evolve.

Certified by:



William Garrison, Dean of USF Libraries

Date: 9/6/11 Email: wgarrison@usf.edu

B. Describe additional library resources that are needed to implement and/or sustain the program through Year 5. Include projected costs of additional library resources in Table 3.

The collections of the USF Tampa Library and affiliates are sufficient to support a PhD Environmental Engineering program and research endeavors. The USF Tampa Library makes sustained annual investments to maintain the recurring elements of the collection and to purchase newly published materials required to preserve sufficiency. Strategic investments are made as new faculty are hired and areas of emphasis evolve. No additional library resources are required to implement and/or sustain the proposed program through Year 5 because the library already provides support for the MS Environmental Engineering programs and for PhD Civil Engineering students who specialize in environmental engineering.

C. Describe classroom, teaching laboratory, research laboratory, office, and other types of space that are necessary and currently available to implement the proposed program through Year 5.

No new courses are being created as part of this proposal. Existing graduate courses are currently taught in buildings throughout the USF campus.

The Environmental Engineering program at USF maintains over 3,500 square feet of research laboratory space, providing state-of-the-art analytical and experimental equipment for chemical and biological research. A separate laboratory (approximately 500 square feet) is dedicated for pilot plant research. The laboratories are equipped with hoods and bench space to accommodate approximately 30 research students. This laboratory and graduate student office space will be increased by approximately 5,300 square feet as there is currently development of additional laboratory space on the first floor of the IDR building. We plan to have an open floor plan, with separate laboratories for trace water quality analysis, appropriate technology, and environmental microbiology. There is a plan to add 28 office spaces for doctoral students and postdoctoral research associates in the new Interdisciplinary Research Building (IDRB) space.

Analytical instrumentation available includes a Perkin-Elmer Clarus 500 GC with autosampler, ECD and FID, a Gow Mac 580 Gas Chromatograph with TCD, a Metrohm 850 professional AnCat IC system, a Shimadzu TOC/TON analyzer, pH, ISE and DO meters and automatic titrators. Field sampling equipment includes battery operated pumps, Van Dorn surface water sampler, Van Veen bottom grab sampler, soil corer, Quanta Hydrolab multimeter probe (pH, DO, T, TDS, Turbidity, Depth) and a variety of handheld meters.

D. Describe additional classroom, teaching laboratory, research laboratory, office, and other space needed to implement and/or maintain the proposed program through Year 5. Include any projected Instruction and Research (I&R) costs of additional space in Table 2. Do not include costs for new construction because that information should be provided in response to X (J) below.

None needed.

E. Describe specialized equipment that is currently available to implement the proposed program through Year 5. Focus primarily on instructional and research requirements.

Analytical instrumentation available includes a Perkin-Elmer Clarus 500 GC with autosampler, ECD and FID, a Gow Mac 580 Gas Chromatograph with TCD, a Metrohm 850 professional AnCat IC system, a Shimadzu TOC/TON analyzer, pH, ISE and DO meters and automatic titrators. Field sampling equipment includes battery

operated pumps, Van Dorn surface water sampler, Van Veen bottom grab sampler, soil corer, Quanta Hydrolab multimeter probe (pH, DO, T, TDS, Turbidity, Depth) and a variety of handheld meters.

F. Describe additional specialized equipment that will be needed to implement and/or sustain the proposed program through Year 5. Include projected costs of additional equipment in Table 2.
N/A

None needed.

G. Describe any additional special categories of resources needed to implement the program through Year 5 (access to proprietary research facilities, specialized services, extended travel, etc.). Include projected costs of special resources in Table 2. N/A

None needed.

H. Describe fellowships, scholarships, and graduate assistantships to be allocated to the proposed program through Year 5. Include the projected costs in Table 2.

There is no plan to allocate additional resources to the department or college to support doctoral students. The College and Department will continue to make a concerted effort to locate graduate research assistantships and other forms of external support for students as was discussed earlier in this proposal. Any student enrolled in the proposed program will be considered for a teaching or research assistant appointment, regardless of the home department of their major graduate advisor(s). Each research faculty members normally supported two or more research assistants. Thus, the Department typically supported 40-80 research assistants per year. Recently, the Provost instituted an initiative to increase the number of PhD students in Engineering. Under this program, the Department brought in 23 new doctoral students to the Department in fall 2010. The support for these new PhD students is \$15,000/year. Year 1 and Year 5 allocations are shown in Table 2.

I. Describe currently available sites for internship and practicum experiences, if appropriate to the program. Describe plans to seek more sites in Years 1 through 5.

Opportunities are available for doctoral students to conduct research and be trained at many federal laboratories; or example, Environmental Protection Agency (EPA), Department of Energy (DOE), National Oceanic & Atmospheric Administration (NOAA), and United States Geological Survey (USGS). In addition, the American Association for the Advance of Science (AAAS) provides opportunities for graduates of environmental engineering programs to be placed for fellowships with federal agencies in the Washington, D.C. area. Some federal funding is available to support students in such programs. In addition, some doctoral students will have their research occurring at local municipal water treatment, stormwater management, and wastewater treatment facilities which provides students opportunities to interact with practitioners.

The Department supports several international opportunities for its graduate students. Two programs are supported by NSF funding and allow students to travel abroad for research and training. The first program supports students to travel to the UNESCO-IHE Water Laboratory (Delft, Netherlands) to conduct research to develop technologies to meet the Millennium Development goals related to water and sanitation. The second NSF-supported program allows students to travel to Bolivia to conduct research in environmental engineering that is related to sustainable development. Our department also has a graduate partnership with the U.S. Peace Corps through the Master's international program where students spend 2+ years overseas working as a water sanitation engineer, while also conducting field research with a developing world focus. The program has been in existence

for 2.5 years and has already attracted 33 domestic graduate students, who come from 31 universities that represent 21 states. One current doctoral student is currently integrating her doctoral degree with the Peace Corps experience.

J. If a new capital expenditure for instructional or research space is required, indicate where this item appears on the university's fixed capital outlay priority list. Table 2 includes only Instruction and Research (I&R) costs. If non-I&R costs, such as indirect costs affecting libraries and student services, are expected to increase as a result of the program, describe and estimate those expenses in narrative form below. It is expected that high enrollment programs in particular would necessitate increased costs in non-I&R activities.

Not applicable

**TABLE I-B
PROJECTED HEADCOUNT FROM POTENTIAL SOURCES
(Graduate Degree Program)**

Source of Students (Non-duplicated headcount in any given year)*	Year 1		Year 2		Year 3		Year 4		Year 5	
	HC	FTE	HC	FTE	HC	FTE	HC	FTE	HC	FTE
Individuals drawn from agencies/industries in your service area (e.g., older returning students)	0	0	0	0	0	0	0	0	0	0
Students who transfer from other graduate programs within the university**	25	18.75	18	13.5	15	11.25	12	9	5	3.75
Individuals who have recently graduated from preceding degree programs at this university	2	1.5	2	1.5	2	1.5	4	3	8	6
Individuals who graduated from preceding degree programs at other Florida public universities	1	0.75	5	3.75	5	3.75	5	3.75	6	4
Individuals who graduated from preceding degree programs at non-public Florida institutions	0	0	0	0	0	0	0	0	0	0
Additional in-state residents***	0	0	0	0	4	3	4	3	5	3.75
Additional out-of-state residents***	0	0	2	1.5	5	3.75	5	3.75	8	6
Additional foreign residents***	2	1.5	3	2.25	4	3	5	3.75	8	6
Other (Explain)***	0	0	0	0	0	0	0	0	0	0
Totals	30	22.5	30	22.5	35	26.25	35	26.25	40	29.5

* List projected yearly cumulative ENROLLMENTS instead of admissions

** If numbers appear in this category, they should go DOWN in later years.

*** Do not include individuals counted in any PRIOR category in a given COLUMN.

**TABLE 2
PROJECTED COSTS AND FUNDING SOURCES**

Instruction & Research Costs (non-cumulative)	Year 1						Year 5				
	Funding Source					Subtotal E&G and C&G	Funding Source				Subtotal E&G and C&G
	Reallocated Base* (E&G)	Enrollment Growth (E&G)	Other New Recurring (E&G)	New Non-Recurring (E&G)	Contracts & Grants (C&G)		Continuing Base** (E&G)	New Enrollment Growth (E&G)	Other*** (E&G)	Contracts & Grants (C&G)	
Faculty Salaries and Benefits	129,767	0	0	0	0	\$129,767	141,456	0	0	0	\$141,456
A & P Salaries and Benefits	0	0	0	0	0	\$0	0	0	0	0	\$0
USPS Salaries and Benefits	0	0	0	0	0	\$0	0	0	0	0	\$0
Other Personnel Services	0	0	0	0	0	\$0	0	0	0	0	\$0
Assistantships & Fellowships	0	0	0	0	450,000	\$450,000	0	0	0	594,000	\$594,000
Library	0	0	0	0	0	\$0	0	0	0	0	\$0
Expenses	0	0	0	0	0	\$0	0	0	0	0	\$0
Operating Capital Outlay	0	0	0	0	0	\$0	0	0	0	0	\$0
Special Categories	0	0	0	0	0	\$0	0	0	0	0	\$0
Total Costs	\$129,767	\$0	\$0	\$0	\$450,000	\$579,767	\$141,456	\$0	\$0	\$594,000	\$735,456

*Identify reallocation sources in Table 3.

**Includes recurring E&G funded costs ("reallocated base," "enrollment growth," and "other new recurring") from Years 1-4 that continue into Year 5.

***Identify if non-recurring.

Faculty and Staff Summary

Total Positions (person-years)	Year 1	Year 5
Faculty	1.1	1.16
A & P	0	0
USPS	0	0

Calculated Cost per Student FTE

	Year 1	Year 5
Total E&G Funding	\$129,767	\$141,456
Annual Student FTE	22.5	29.5
E&G Cost per FTE	\$5,767	\$4,795

TABLE 3
ANTICIPATED REALLOCATION OF EDUCATION & GENERAL FUNDS

Program and/or E&G account from which current funds will be reallocated during Year 1	Base before reallocation	Amount to be reallocated	Base after reallocation
Total Department Costs	778,943	\$129,767	\$649,176
	0	0	
	0	0	
	0	0	
	0	0	
	0	0	
Totals	\$778,943	\$129,767	\$649,176

**TABLE 4
ANTICIPATED FACULTY PARTICIPATION**

Faculty Code	Faculty Name or "New Hire" Highest Degree Held Academic Discipline or Speciality	Rank	Contract Status	Initial Date for Participation in Program	Mos. Contract Year 1	FTE Year 1	% Effort for Prg. Year 1	PY Year 1	Mos. Contract Year 5	FTE Year 5	% Effort for Prg. Year 5	PY Year 5
A	Jeffrey Cunningham Civil & Environmental Engrg	Asst. Prof.	Tenure	fall 2011	9	1.00	16.00	0.12	9	1.00	17.50	0.13
A	Sarina Ergas Civil & Environmental Engrg	Assoc. Prof.	Tenure	fall 2011	9	1.00	25.00	0.19	9	1.00	25.00	0.19
A	James Mihelcic Civil & Environmental Engrg	Prof.	Tenure	fall 2011	9	1.00	25.00	0.19	9	1.00	25.00	0.19
A	Peter Stroot Civil & Environmental Engrg	Asst. Prof.	Tenure	fall 2011	9	1.00	16.00	0.12	9	1.00	17.50	0.13
A	Amy Stuart Civil & Environmental Engrg	Asst. Prof.	Tenure	fall 2011	9	1.00	16.00	0.12	9	1.00	17.50	0.13
A	MayaTrotz Civil & Environmental Engrg	Assoc. Prof.	Tenure	fall 2011	9	1.00	16.00	0.12	9	1.00	17.50	0.13
A	Daniel Yeh Civil & Environmental Engrg	Asst. Prof.	Tenure	fall 2011	9	1.00	16.00	0.12	9	1.00	17.50	0.13
A	Qiong Zhang Civil & Environmental Engrg	Asst. Prof.	Tenure	fall 2011	9	1.00	16.00	0.12	9	1.00	17.50	0.13
Total Person-Years (PY)								1.10				1.16

Faculty Code	Source of Funding	PY Workload by Budget Classification				
		Year 1	Year 5			
A	Existing faculty on a regular line	Current Education & General Revenue	1.10	1.16		
B	New faculty to be hired on a vacant line	Current Education & General Revenue	0.00	0.00		
C	New faculty to be hired on a new line	New Education & General Revenue	0.00	0.00		
D	Existing faculty hired on contracts/grants	Contracts/Grants	0.00	0.00		
E	New faculty to be hired on contracts/grants	Contracts/Grants	0.00	0.00		
Overall Totals for			Year 1	1.10	Year 5	1.16



University of Nevada, Reno

May 22, 2011

Dr. Karen D. Liller, Ph.D.
Dean of the Graduate School and Associate Vice President for Research and Innovation
University of South Florida
4202 E. Fowler Avenue
Tampa, FL 33620

Dear Dr. Liller,

In response to the request to provide an external review of the University of South Florida's (USF's) proposal to offer a PhD in Environmental Engineering, I am providing the following report. Prior to the report, I will briefly introduce myself. I am currently Professor and Chair of the Department of Civil and Environmental Engineering at the University of Nevada, Reno. From my attached CV, you will note that I am currently on the Environmental Engineering Foundation (EEF) Board of Directors and in 2007-2008 I was president of the Association of Environmental Engineering and Science Professors (AEESP). I am familiar with the University of South Florida's program and faculty through a visit two years ago and by reading the proposal provided to me. I am also familiar with the program because I have been impressed with its recent growth and notable hires.

Need for Program Nationally

Environmental engineering is a diverse profession that has historically been housed in Civil Engineering and Chemical Engineering, and also in Agricultural Engineering and Mining/Geological Engineering departments. More recently, the field of environmental engineering has become more distinct and has undergone significant growth – most likely as its focus has shifted from control of existing pollution problems to prevention of problems and addressing emerging public health concerns. Indication of this growth and projections for the future are comprehensively indicated in the proposal by the following statements:

- The U.S. Bureau of Labor Statistics predicts this field to have the highest growth of all engineering disciplines between now and 2018
- CNNMoney.com reports it as the 5th best job available out of 100 ranked (Civil Engineering was ranked 6th)

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- Empower Me Magazine lists it as one of five “hottest green, environmental and infrastructure jobs for the next 10 years

Potential Student Employment

The Chronicle of Higher Education (<http://chronicle.com>, July 10, 2009, v. 55(41), p.B22) reported a list of “some of the academic fields...experts believe will be “hot” over the coming decade.” Among the predicted hot academic jobs are those in green chemistry, energy, gerontology, education, nanotechnology, health policy, information technology, and engineering. A total of 662,000 faculty jobs are expected to become available in these fields from 2006 to 2016 according to the U.S. Bureau of Labor Statistics. Specifically, a 25-percent growth is expected for environmental engineering faculty positions. This expected growth for academic positions mirrors the fast growth expected for the general field of environmental engineering. Over the 2010-2011 academic year, there were more than 80 open academic positions in environmental engineering. These included tenured, tenure-track, and research faculty positions in areas such as advanced disinfections processes, microbial ecology, membranes or desalination, and treatment processes. These positions exist in universities and institutions nationally and worldwide. In addition to academic faculty positions, graduates from the proposed PhD program would be well-equipped to pursue research careers at national or private laboratories and to perform specialized job functions at engineering consulting firms.

Core Courses and Capacity to Offer Courses

Clearly, an increasing number of well-prepared PhD students are needed. USF already has approximately 30 PhD students who are concentrating in environmental engineering, some of whom may go on to fill these academic positions. To provide them with a PhD specifically in environmental engineering would give greater identity to these students and to the program. It would also distinguish the USF program from the majority of other PhD programs that offer specialization in environmental engineering but not a PhD in environmental engineering specifically.

The four core courses for this program have been identified as:

- Physical and Chemical Processes
- Biological Principles
- Aquatic Chemistry
- A Sustainability Course

The first three of these courses are common to most programs in environmental engineering; however, the sustainability course is unique and serves as another distinguishing factor for this program. The three options for satisfying the sustainability component clearly reflect the competency of the environmental engineering faculty members in one of the more cutting-edge and compelling aspects of the field.

Faculty Qualifications

As mentioned in the proposal – and has been evident to the environmental engineering community – USF has invested considerable resources in hiring eight top-quality faculty members focused on environmental engineering. Clearly these faculty members are maintaining high levels of research productivity and consequently, they are mentoring relatively high numbers of PhD students. This is not only an important criteria in tenure and promotion for the individual faculty members, but also in national rankings. The high PhD productivity per faculty merits acknowledgment and to proceed with offering a PhD in Environmental Engineering would not only provide acknowledgment, but would also be an outstanding recruiting tool for future PhD candidates. Furthermore, from the grant funding described in the proposal, the faculty members are successfully pursuing federally-competitive graduate fellowship and scholarship grant programs that will further assist in recruitment of top PhD candidates. In addition to the fellowship and scholarship grant programs, the faculty have also been successful in competing for funding from numerous other granting programs/agencies.

Quality of Resources

The strength of a graduate program is a reflection of the quality of the faculty and their research programs; the overall faculty and research quality at USF is very high. The existing space, equipment, supplies, and library materials are more than adequate to support the program. Most notably, dedicated space for pilot plant research is critical given the research programs of the faculty members. Also, the plans to increase laboratory space to 5,000 sq ft with an open floor plan is advantageous for further development of the research program.

The faculty and these resources are what enabled USF to win a competitive proposal to host the Association of Environmental Engineering and Science Professors' 2011 Education and Research Conference. This Conference will give USF the opportunity to showcase their program and to gain national recognition for their unique and distinguished program in environmental engineering.

Regional Significance of Program

In addition to having the necessary resources to maintain a highly effective program, the University of South Florida is in an ideal location in terms of the regional significance of environmental engineering. The state of Florida leads the nation in desalination capacity. Population growth and the increasing demand for water, coupled with the State's vulnerability to drought events, are compelling water planners to also consider wastewater reuse. For this reason, a program addressing urban water infrastructure and environmental protection is not only a national, or international need, but a serious regional need as well.

In closing, I would like to say that this was an extremely well-written proposal that clearly documents the need for this degree program and its high level of readiness. The ability to offer a PhD in Environmental Engineering would give greater identity to this program and its graduates which would, in turn, be useful in future recruiting of high quality graduates and further gain in national rankings and visibility.

Sincerely,



Amy Childress
Professor and Chair

Cc: Dr. William Carpenter, Chair of Civil and Environmental Engineering
Dr. John M. Wiencek, Dean of Engineering



Office of the Provost
and Senior Vice President

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August 1, 2011

Dr. Ralph Wilcox
Executive Vice President & Provost
University of South Florida
4202 E Fowler Avenue, CGS 401
Tampa, FL 33620

Dear Ralph,

Your graduate dean wrote asking for UF's endorsement of USF's proposal to create a doctoral degree in Environmental Engineering. We have no objection to the creation of this degree, and, in fact, we believe that it will contribute to the State's goal of increased production of STEM graduates. In particular, additional doctorally-trained engineers will improve the climate for innovation and industry in the state.

Sincerely yours,

A handwritten signature in black ink that reads "Joseph Glover". The signature is written in a cursive, flowing style.

Joseph Glover
Provost

JG/cdm



Office of the Provost and Vice President
for Academic Affairs

July 20, 2011

Dr. Ralph Wilcox
Provost and Executive Vice President
University of South Florida
Tampa, FL

Dear Provost Wilcox:

I write in support of the proposed Ph.D. program in Environmental Engineering at the University of South Florida. While the addition of this program at USF may impact enrollment in UCF's Environmental Engineering program, any impact is expected to be minor.

We wish you the best with the proposed new program and would welcome opportunities to collaborate in both instruction and research.

Sincerely,

A handwritten signature in cursive script that reads 'Tony G. Waldrop'.

Tony G. Waldrop, Ph.D.
Provost and Vice President for Academic Affairs
Professor of Biomedical Sciences