

EXHIBIT A

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June 14, 2019

David Willems, P.E.
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Enclosed is a proposal for the research project we have been discussing, entitled "FGCU Estero River Bacteria-Nutrient Source Identification."

The work will be conducted by L. Donald Duke, Ph.D., P.E., Principle Investigator; Serge Thomas, Ph.D., Co-Principle Investigator; Hidetoshi Urakawa, Ph.D., Co-Principle Investigator; and FGCU scholars, staff, and advanced students under our direction.

The proposed project period is August 15 2019 – December 14 2020, to be adjusted so that work may begin when the contract is executed and will continue for a period of 15 months. The total proposed amount is \$48,193. The scope of work, project rationale and goals, proposed tasks, and itemized budget are described in two documents, attached.

To respond to this proposal, please contact me at the above address, or at ldduke@fgcu.edu, or at 239-590-7452; or alternately in my absence please contact:

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We look forward to working with you on this.

Best regards,



L. Donald Duke, Ph.D., P.E.

cc Ashley Jones; Serge Thomas; Hidetoshi Urakawa; Mary Abercrombie; Charles Gunnels;
S. Gregory Tolley

Florida Gulf Coast University
Partnership for Estero River Watershed Studies, The Water School

Proposal to Village of Estero:
Estero River Bacteria-Nutrient Source Identification

June 14, 2019

Principal Investigators:

L Donald Duke, Ph.D., P.E.
Serge Thomas, Ph.D.
Hidetoshi Urakawa, Ph.D.

Overview

This research is designed to identify, characterize, determine sources, and to the extent possible, quantify loads of bacteria and nutrients in the Estero River, with particular attention to detecting and quantifying sources located downstream of The Villages at Country Creek that are suspected of being a potential source.

The project period will encompass 15 months, beginning on or about August 15, 2019 and concluding in December 2020 at a point 15 months after the selected start date. The research will conduct 12 months of field sampling, capturing one full year's hydrologic cycle. During that period laboratory analysis and preliminary data analysis will also be conducted. After field sampling concludes, the project will continue for an additional 3 months to complete any final laboratory testing, finalize analysis of results, and write a final report. If the start is delayed then research completion will be 15 months after the start date.

The research will be conducted by three FGCU faculty (PI L D Duke and co-PIs Serge Thomas and Hidetoshi Urakawa, all from the Department of Marine and Ecological Sciences); two Graduate Student Researchers to be identified; and one or more undergraduate research assistants to be identified. The research will be assisted by Laboratory Manager Haruka Urakawa and Dr. Mary Abercrombie, both also from the Department of Marine and Ecological Sciences.

A. MONITORING PROGRAM

The research will conduct field sampling over one year to characterize bacteria and nitrogen during wet and dry season, to attempt to differentiate the ways in which bacteria and nutrients originate and are mobilized. Dry season flow originates largely as discharge of surficial groundwater, and wet season flow includes both increased surficial

groundwater discharge (as water table rises during that season) and surface runoff. During the wet season the project will conduct monitoring that will distinguish loads in runoff from storm events (which would suggest sources in leaking waste conveyances and/or in surface land use activities) vs those carried in sustained flow during wet season (which would suggest soil and sediment sources). In addition, sediment, riverbank soil and plant samples will be collected to identify the potential source of microbial contamination.

1. Estero River monitoring: Locations

The following field monitoring design is the pre-project plan that describes anticipated activities. The exact number, timing, and location of samples and nature of lab tests may be modified slightly, for example to adapt to field limitations; weather conditions; and findings from analysis of early samples. Changes will be made with concurrence of Estero personnel.

- a. Collect samples from boats at six locations to be selected, mid-stream at locations immediately upstream from, downstream from, and within the target area that previous data suggest to be the location of bacteria sources. Locations to be selected during pre-sampling project phase, as soon as possible after contract is executed, using visual observations by project team.
- b. Collect from two fixed points on public property, from road overpasses where Corkscrew Road and Three Oaks Parkway cross the Estero River (south fork of the North Branch, i.e. directly at and immediately upstream of the Villages at Country Creek). These are on very low-flow parts of the waterbody and may not be accessible by boat.
- c. Share Lee County data and, if permissible, ask Lee County agencies to collect and forward samples of water to FGCU for testing of the same samples, from future samples of the existing monthly monitoring program. In particular, ask to have the agency collect and forward to us samples from three locations on the North Branch Estero River:
 - 47A-4GR, just south of Broadway downstream of Koreshan State Park;
 - 47A-15GR, at Tamiami Trail at the northern boundary of Koreshan State Park;
 - 47A-28GR, well upstream of the target area, at Three Oaks Parkway on the northern fork of the North Branch Estero River.

These sites bracket upstream and downstream of the area that previous monitoring suggests bacteria loads appear to enter the River.

Some of these will be tested for genetic sequencing and/or for acetaminophen and sucralose, i.e. will not duplicate lab testing conducted by Lee County.

2. Estero River monitoring: Frequency

All above locations will be sampled at each of the following times, but not all samples will be tested for all analytes.

a. Targeted at storm event runoff

Sample during runoff after substantial storm events (> 2 cm), within 12 hours after major precipitation ends. Three sampling events: two during wet season, one during dry season.

3 storm events * 11 sampling locations = 33 samples.

b. Wet season between storms

Collect samples on 6 occasions NOT associated with a storm (no less than 4 days after a substantial rainfall of > 2 cm) during wet season, encompassing June – November. Collect samples at least 21 days apart.

6 non-storm events * 11 sampling locations = 66 samples.

The researchers will coordinate with Lee County personnel so that at least some of the project's wet-season samples are collected on the same day as, or within 48 hours of, samples collected by Lee County. FGCU will request Lee County to collect and deliver to us samples from that same sampling event such that some of them can be tested for genetic sequencing and some forwarded to off-campus lab for testing for acetaminophen and sucralose.

c. Dry season between storms

Collect samples on 5 occasions NOT associated with a storm (no less than 4 days after a substantial rainfall of > 2 cm) during dry season, encompassing December – May. Collect samples at least 21 days apart.

5 non-storm events * 11 sampling locations = 55 samples.

The researchers will coordinate with Lee County personnel so that at least some of the project's dry-season samples are collected on the same day as, or within 48 hours of, samples collected by Lee County. FGCU will request Lee County to collect and deliver to us samples from that same sampling event such that some of them can be tested for genetic sequencing and some forwarded to off-campus lab for testing for acetaminophen and sucralose.

d. Groundwater samples

Locations:

Six locations to be selected, between the Estero River and known potential sources. Locations will be identified on public land (State Park or other), and permission will be obtained before equipment installation may begin. Locations will be selected during pre-

sampling project phase, as soon as possible after contract is executed, using visual observations by project team.

Temporary sampling sites / piezometers will be installed and removed after the project's completion. Cost for materials, equipment, and supplies to install, prepare, sample, and remove six groundwater sampling stations is approximately \$5,000, described in further detail in Budget and Budget Justification, attached.

Frequency:

Samples will be collected four times during wet season and four times during dry season during the same day, or as close as practicable, as eight occasions on which sampling will be conducted at the surface water locations described above.

B. LABORATORY ANALYSIS

Test for two groups of bacteria: *Enterococcus* because it is the target organism for marine water quality standards; and *Escherichia coli* to capture any variation. Testing for two species is recommended because the literature shows that any single indicator can be inconsistent and can miss bacteria sources/loads. \$20 / sample tested for both species. Cost could be reduced if e.g. half the samples are tested for both species to check for variability, testing the other half for *Enterococcus* only.

Test also for nitrogen species as a means to characterize load, and because nitrogen compounds (especially ammonia) can be linked to the kinds of sources investigated here, i.e. human waste and sources of bacteria potentially growing in soils and sediments. \$10 / sample tested for NO₃-N, TKN, NH₃-N, and TN; and for PO₄.

Test a portion of these using genetic sequencing to characterize the proportion originating with humans vs. other organisms. Conducted for only a portion of the samples because a subset will be sufficient to indicate which organism(s) are the major origins of bacteria to this waterbody. Samples to be tested will depend on which samples are found to have high concentrations of bacteria, and will include samples from groundwater, storm-event sampling, and between-storm sampling from all reaches of the Estero River where bacteria are found in high concentrations. Conducted at FGCU labs @ \$100 / sample tested

Test a portion of these samples for indicators of wastes from human origin: acetaminophen and sucralose. Send to off-campus lab for testing @ \$100 / sample tested. (This is an approximate cot: more exact costs will require a quote from an off-campus lab). Select a portion of those that are selected for genetic sequencing, and a portion that are not.

C. DATA ANALYSIS**1. Graph and interpret data**

Determine more precisely the location(s) where bacteria enter the Estero River.

2. Determine locations and preliminary/approximate quantification

Prepare GIS map of information above. Compute approximate load using rainfall data; existing model and information about groundwater flows; and loading data acquired through this project.

D. BUDGET

The budget is itemized attached Budget and Justification worksheet.

Approximate costs in major categories of budget are:

A. Senior Personnel (three faculty – salaries plus benefits)	\$9,000
B. Student salaries	\$20,500
C. Student benefits (tuition)	\$6,700
D. Equipment/supplies	\$9,000
E. Indirect costs	\$3,000
Total	<hr/> \$48,200

Florida Gulf Coast University Board of Trustees
Budget Worksheet

Categories	Description	Proposed Costs	Total
Personnel	Dr. L. Donald Duke – .25 months – 2.75% effort	\$2,464	\$2,464
	Dr. Hidetoshi Urakawa, .35 months - 3.89% effort	\$2,601	\$2,601
	Dr. Serge Thomas, .35 months - 3.89% effort	\$2,516	\$2,516
<i>Personnel Subtotal</i>		\$7,581	\$7,581
Fringe Benefits	Dr. L. Donald Duke – 18.1% summer fringe	\$446	\$446
	Dr. Hidetoshi Urakawa- 18.1% summer fringe	\$471	\$471
	Dr. Serge Thomas - 18.1% summer fringe	\$455	\$455
<i>Fringe Subtotal</i>		\$1,372	\$1,372
Participant Support	1 graduate students 2 semesters each, FL in-state tuition	\$6,721	\$6,721
	2 graduate students 2 semesters @ \$3500/semester, 20 hr/wk, 15 wk/semester (\$11.67/hr); 1 graduate student 8 wks summer 20 hr/wk @ \$11.67/hr	\$15,867	\$15,867
	1 undergraduate assistant @ \$10/hr, 10 hr/wk, 30 weeks academic year; 1 undergraduate assistant @ \$10/hr, 20 hr/wk, 8 weeks summer	\$4,600	\$4,600
<i>Participant Support Subtotal</i>		\$27,188	\$27,188
Other Direct Costs	Materials and Supplies	\$3,000	\$3000
	Boat/Vehicle Use for Sampling	\$6,000	\$6,000
<i>Other Direct Costs Subtotal</i>		\$9,000	\$9,000
Total Direct Costs		\$45,141	\$45,141
Indirect Cost of MTDC (\$17,953)	Indirect Cost – 17%**	\$3,052	\$3,052
Total Project Cost		\$48,193	\$48,193

** See attached Federally Negotiated IDC Agreement

Budget Justification

A. Senior Personnel

As Principle Investigator (PI), Dr. L D Duke will commit .25 person-months (2.75% of effort) for 1 summer month 2020 .

As Co-Principle Investigator (Co-PI), Dr. Serge Thomas will commit .35 person-months (3.89% of effort) for 1 summer month 2020.

As Co-Principle Investigator (Co-PI), Dr. Hidetoshi Urakawa will commit .35 person-months (3.89% of effort) for 1 summer month 2020.

B. Fringe Benefits

For Faculty and other full-time personnel, fringe benefits are calculated to include State Health Insurance (per individual cost), State Life Insurance (1.5%), State Retirement (7.98%), FICA Medicare (1.45%) and FICA-OAS Social Security (6.20%). For Students and other part-time personnel, fringe benefits include FICA (7.65%) of requested wages.

C. Participant Support

One Graduate Student Researcher from the Environmental Science MS Program in the College of Arts and Sciences will work with the PI and Co-Pis to perform field sampling, laboratory analysis, and data analysis for 20 hours per week for 15 weeks during each of Fall 2019 and Spring 2020 at a stipend of \$3500 per semester, and will receive tuition reimbursement for 2 semesters for a total of \$6,720.84

One Graduate Student Researcher from the Environmental Science MS Program in the College of Arts and Sciences will work with the PI and Co-Pis to perform field sampling and laboratory analysis for 20 hours per week for 15 weeks during each of Fall 2019 and Spring 2020 at a stipend of \$3500 per semester

One Graduate Student Researcher from the Environmental Science MS Program in the College of Arts and Sciences will work with the PI and Co-Pis to perform field sampling, laboratory analysis, and data analysis for 21.5 hours per week for 8 weeks during Summer 2020 at a rate of \$11.67 per hour

One Undergraduate Student Research Assistant from the Environmental Studies BA Program in the College of Arts and Sciences will work with the PI and Co-Pis to perform field sampling, laboratory analysis, and data analysis for 10 hours per week for 15 weeks during each of Fall 2019 and Spring 2020 at a rate of \$10.00 per hour

D. Other Direct Costs

Materials & Supplies

Supplies for installing groundwater sampling piezometers: PVC, bentonite, sand, etc. for 6 sampling stations = \$1,000

Use of boat, vehicle, other equipment for field work - groundwater sampler installation and removal = \$2,000

Use of boat, vehicle, other equipment for field work - in-stream sampling by boat, sampling from fixed location at overpasses = \$4,000

Laboratory equipment, chemicals, supplies = \$2,000

E. Total Direct Costs

Personnel: \$7,581

Fringe: \$1,372

Participant Support Costs: \$27,188

Other Direct Costs: \$9,000

Total Direct Costs: \$54,141

F. Indirect Costs

Modified Total Direct Costs (does not include participant support costs): \$17,953

Indirect Costs (17%): \$3,052

G. Total Project Costs: \$48,193