PINELLAS COUNTY RESTORE ACT DIRECT COMPONENT PROJECT PROPOSAL SUBMITTAL FORM

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1. **POC Name:** Dr. Robert Weisberg

2. **POC Organization:** University of South Florida, College of Marine Science

3. **POC Title:** Distinguished University Professor

4. **POC Email:** weisberg@usf.edu

5. **POC Phone:** 727-553-1568

6. **Proposed Activity Name:** A very high resolution estuary circulation nowcast/forecast model for Tampa Bay and vicinity.

7. **Restoration Council Goals Addressed:**

(Step 1 and Step 2 - Criteria 1 and 2)
List which of the following goal(s) will be addressed and how each goal will be addressed.

A. Restore and Conserve Habitat
B. Restore Water Quality
C. Replenish and Protect Living Coastal and Marine Resources
D. Enhance Community Resilience
E. Build and Revitalize the Gulf Economy

This project primarily addresses Council goals B. and D., and as part of a larger coordinated observing and modeling system it addresses all five goals. The proposed Tampa Bay and vicinity circulation model will be part of the Coastal Ocean Monitoring and Prediction System (COMPS) initiated by the College of Marine Science at USF in 1998 to observe and predict coastal ocean phenomena of societal importance. COMPS is a collection of observations of surface meteorology, ocean currents, waves, temperature and salinity using moored buoys, HF-radar and robotic gliders, all supporting predictive models.

The primary COMPS West Florida coastal Ocean Model (WFCOM) presently runs as an automated, daily nowcast/forecast model providing information on the coastal ocean circulation from west of the Mississippi River to south of the Florida Keys, including all of the major estuaries. Unique to the present proposal is a very high resolution version (to be nested in WFCOM) that will include Tampa Bay, Sarasota Bay, the Intracoastal Waterway and all of the inlets connecting these water bodies with the adjacent Gulf of Mexico.

A., B. & C. Restore and Conserve Habitat; Restore Water Quality; Replenish and Protect Living Coastal and Marine resources

Habitat, water quality and living coastal marine resources all fall under the umbrella of coastal ocean ecology as ecology integrates all of the processes that are responsible for

organism success. This success (or lack of it) begins with the coastal ocean circulation which unites nutrients with light, fueling primary productivity and thence all higher trophic level interactions. It is this coastal ocean circulation that determines the evolution of the water properties within an organism's habitat, including nutrients and pollutants. Thus, the utility of COMPS in understanding and predicting coastal ocean circulation directly applies to any efforts regarding restoration and conservation of habitat, water quality or living marine resources. Moreover, Tampa Bay water properties are largely determined by Tampa Bay interactions with the adjacent Gulf of Mexico; hence modeling these water bodies as a system is necessary for ecological understanding and prediction.

D. Community Resilience

COMPS modeling capabilities can be utilized as effective community resilience tools. This was demonstrated very successfully during the Deepwater Horizon spill as COMPS was shown to be effective for tracking surface and subsurface oil during the spill, and this utility would apply to any future hazardous material spill. Given the uniquely fine resolution of the proposal model it could even predict where the raw sewage would have gone from the recent pipe break near Boca Ciega Bay. Additionally, such model has been shown to be effective at determining the potential for damage and destruction of hurricane storm surge and waves. An automated nowcast/forecast model with daily updates as proposed would provide pertinent information to emergency management personnel.

E. Build and Revitalize the Gulf Economy

Similar to the economy of the gulf, the state of funding for COMPS suffered greatly in the wake of the Deepwater Horizon spill. Ironically, the prospect of penalty monies ended the availability of other funds for observing systems such as COMPS and to this point RESTORE funds have not supported such systems. We maintain that investment in a scientifically defensible monitoring and prediction system such as COMPS will have longstanding positive economic benefits to the local region as it provides valuable information to both recreational and commercial mariners, beach goers, tourists and county planners.

8. RESTORE Act Eligible Activities Addressed:

(Step 1 and Step 2 - Criteria 3 and 4)

List which of the following activities will be addressed and how each activity will be addressed.

1. **Restoration/protection of natural resources, ecosystems, fisheries, marine wildlife habitats, beaches, and coastal wetlands**
2. **Mitigation of damage to fish, wildlife, and natural resources**
3. Implementation of Federally-approved marine, coastal, or comprehensive conservation management plan, including fisheries monitoring
4. Workforce development and job creation
5. Improvements to or on State parks in coastal areas affected by Deepwater Horizon oil spill
6. Infrastructure projects benefitting the economy or ecological resources, including port infrastructure
7. **Coastal flood protection and related infrastructure**
8. **Promotion of Gulf Coast Region tourism, including recreational fishing**

9. Promotion of the consumption of seafood harvesting from the Gulf Coast Region
10. **Planning assistance**

1. & 2. Restoration/protection of natural resources, ecosystems, fisheries, marine wildlife habitats, beaches and coastal wetlands; Mitigation of damage to fish, wildlife and natural resources

As in addressing Question 7, goals A, B and C we reiterate that coastal circulation is the underpinning for ecosystem functionality. Ecology is multidisciplinary, it is biology and it is chemistry and it is most certainly the physics of circulation which connects the deep ocean to the continental shelf and the shelf with the estuaries. Circulation plays a foundational role in ecosystem dynamics, habitat accessibility, beach morphology and the flushing of coastal wetlands. Larvae, nutrients and pollutants are advected with currents making the ability to understand and predict circulation dynamics necessary to any complete discussion of these RESTORE Act activities.

7. Coastal flood protection and related infrastructure

The proposed model has been shown to be effective at determining the potential for damage and destruction of hurricane storm surge and waves in hindcast mode. An automated nowcast/forecast model with daily updates as proposed would provide pertinent information to emergency management personnel.

8. Promotion of Gulf Coast Region tourism, including recreational fishing

Recreational fishing for shallow water gamefish within Tampa Bay is extremely popular and constitutes not only a large percentage of charter and personal fishing outings but also numerous tournaments throughout the year. A high resolution, publically accessible circulation model is not only informative to the experienced fisherman but also encourages safe boating through knowledge of local currents and present conditions.

10. Planning assistance

The proposed high resolution model will be of great assistance to planners. The previously sited sewage leak in Boca Ciega Bay is one example. As another example consider the 1993 fuel oil spill in lower Tampa Bay. No tools existed then to predict how that oil would move once it left the bay and how and when it would be transported into Blind Pass and Johns Pass. Our model has that capability to inform city planners and emergency management

9. Previous Claim:

Is the proposed activity included in any claim for compensation paid out by the Oil Spill Liability Trust Fund after July 6, 2012? If yes, this activity is not eligible for Direct Component grant.
Yes: ___ No: X

10. RESTORE Act Pinellas County priorities addressed:

(Step 2 - Criteria 5 and 6)
List which of the following priorities will be addressed and how each priority will be addressed.

a. **Protect and restore native habitats**

b. Provide stormwater quality improvements
c. Create policies, programs, and/or mechanisms to remediate environmental and/or economic damages
d. Create policies, programs, and/or mechanisms to protect against future environmental and/or economic vulnerability
e. Provide climate change/sea-level rise planning, adaptation and/or related community engagement
f. Provide flood and storm protection to infrastructure and other publically owned assets that consider resilience and changing sea levels
g. Implement or further actions in the Pinellas County Post Disaster Redevelopment Plan Link to Plan: http://www.postdisasterplan.org/pdrp.shtml
h. Diversify and improve the economy including tourism
i. Promote sustainable recreational fishing and consumption of seafood dependent on Gulf ecosystem, and/or protect or promote working waterfronts

a. Protect and restore native habitats;

As outlined in Questions 7 and 8 above, circulation plays a foundational role in coastal ocean ecology and habitat and this is certainly true in the dynamic Tampa Bay estuary. As Florida's largest open water estuary Tampa Bay is home to over 200 species of fish, as well as many types of marine invertebrates, mammals, birds and sea grasses. Any discussion of habitat health or restoration must be predicated on an understanding of the circulation in the bay, and the proposed high resolution model enables the resolution of circulation on spatial scales not possible until now.

c. Create policies, programs, and/or mechanisms to protect against future environmental and/or economic vulnerability

With a population of nearly 3 million in the metro and micropolitan areas and a busy port with over 80 miles of dredged shipping channels, the repeat of past damage to water quality and habitat is a near constant concern. The accuracy of the proposed high resolution model and the ability to serve it to the public allows for informed discussion and planning regarding potential hazardous material spills or natural occurrences that may occur. This applies to planned infrastructure improvements and their associated effects, and example of which is outlined in the referenced journal article detailing the influences of channel deepening and widening on the tidal and non-tidal circulation in Tampa Bay. Without this high resolution model such a study would not be possible.

g. Implement or further actions in the Pinellas County Post Disaster Redevelopment Plan

Accurate, high resolution knowledge of the circulation patterns under a variety of extreme weather scenarios impacting the Tampa Bay region allows for more informed implementation of the PDRP. With damage will come debris and possible loss of life and understanding where the water will go is vital to planning for the consequences of such a disaster.

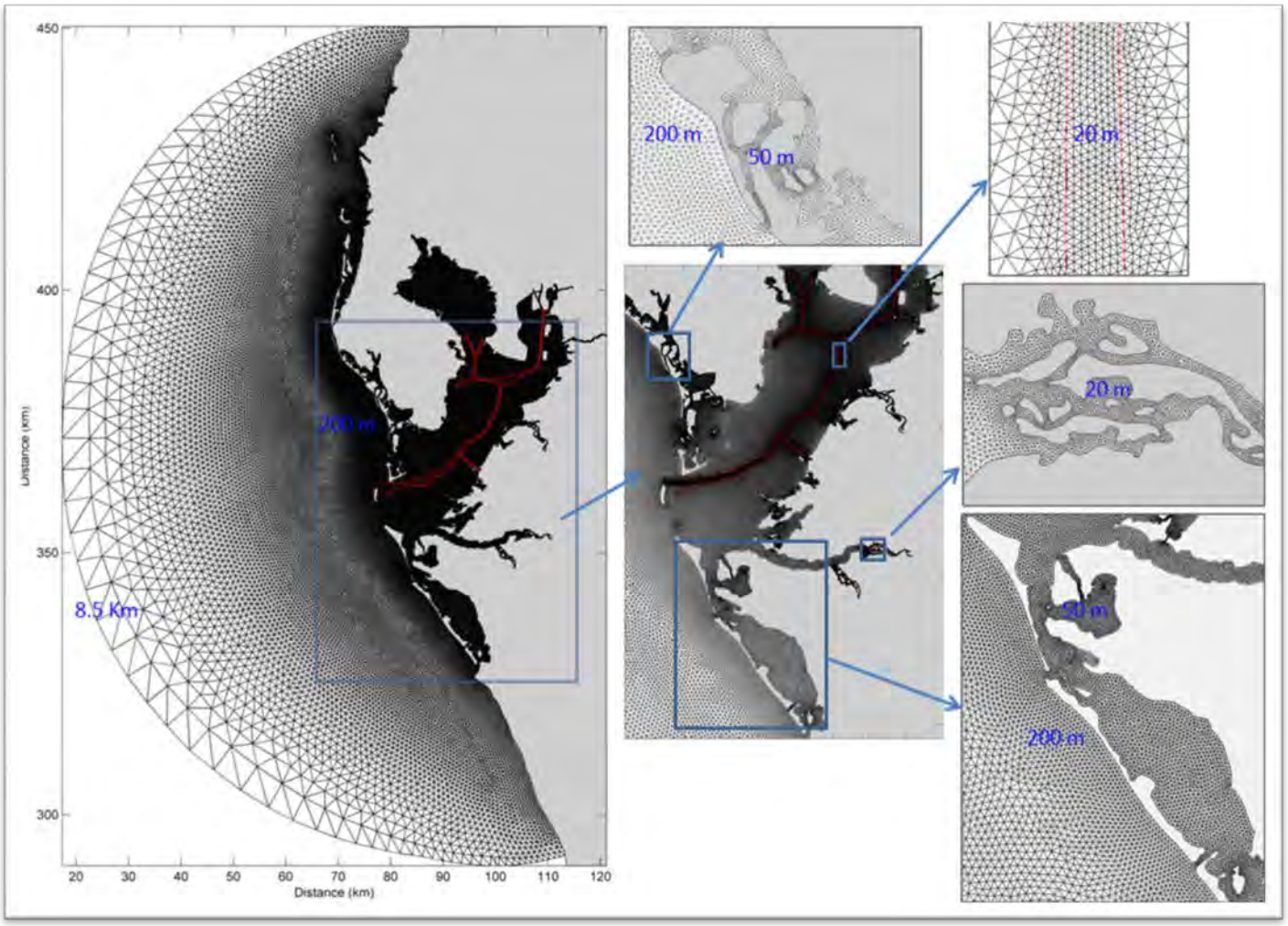
11. Project Location

Project location. Showing Tampa Bay, Sarasota bay and associated inlets and ICWW.

12. Region or Geographic Area Impacted by Project
(Step 1 and Step 2 - Criterion 7)
Provide a description of the project area or region in which environmental or economic benefits will be realized. Be as specific as possible by listing cities or geographical boundaries and why.

The implementation of the high resolution Tampa Bay model will affect Tampa Bay, Boca Ciega Bay, Sarasota Bay and the surrounding areas. Once demonstrated the model can be expanded to other estuaries along the coast (e.g. Charlotte Harbor).

Discussion of Specific Activity



Describe the project by responding to each of the following topics.

13. Project Description – Discuss the essential elements of the project. Include what is proposed, clearly list major project tasks or program milestones, the project duration, and why it should be done.

We propose a very high resolution and accurate numerical circulation model for the Tampa Bay estuary and vicinity [including the Intra-Coastal Waterway (ICWW), Boca Ciega Bay, Tampa Bay,

Sarasota Bay and all of the major inlets and waterways]. The model exists and is vetted through publications in refereed professional journals. The next step is to set it up as an automated, daily nowcast/forecast publically available on the internet. Applications include safe and efficient navigation, water quality, larval fish recruitment, harmful algal blooms and other ecological phenomena. What makes this model unique is its fine resolution (20m), enabling the inclusion of all relevant conveyances of mass. For instance, no other estuary model includes the ICWW and all of the relevant inlets, which are necessary to properly address the flushing of water bodies and the three dimensional distribution of water properties and their transport that are so important to pollutant and water quality studies. As an example, consider the 1993 fuel oil spill in lower Tampa Bay. No tools existed then to predict how that oil would move once it left the bay and how and when it would be transported into Blind Pass and Johns Pass. Our model has that capability. Another example is a recent sewage spill from a pipe break that sent raw sewage into Boca Ciega Bay. An automated nowcast/forecast model with daily updates would provide pertinent information to emergency personnel.

Other models exist, for instance the NOAA TBOFS. However, our approach is more accurate and more complete, in part because of higher resolution and hence inclusion of the various inlets and in part because it more accurately links the adjacent Gulf of Mexico with Tampa Bay, Sarasota Bay and the ICWW. The proposed model is also supported by the larger scale COMPS system of coastal ocean observations and larger scale models to which ours may be nested.

Our applications go beyond the estuarine circulation driven by tides, winds and rivers, or water quality considerations. Estuary and coastal ocean ecology does not just happen. It begins with the uniting of nutrients with light, fueling primary productivity and thence all subsequent trophic level interactions. The underpinning is the coastal ocean circulation that determines the evolution of the water properties in which organisms live, including nutrients and pollutants. The deep ocean connects with the continental shelf, the continental shelf connects with the estuaries, and it is through these connections, across space, time and trophic levels, that ecosystem services derive. If we are to manage our coastal ocean resources and predict the consequences of either human-induced or natural occurrences then we must know how the system works. This requires a comprehensive, multidisciplinary set of observations, coordinated with science-based models for integration, hypotheses testing and prediction. Proposed herein is that modeling framework which properly links the estuaries with the adjacent ocean.

14. Project Manager and Key Project Team Members - include credentials and experience doing similar work.

Project Manager: Dr. Robert Weisberg, USF Distinguished University Professor

Dr. Weisberg has over 40 years of oceanographic research experience with nearly 25 years of research specifically on the west Florida shelf. With over 90 papers in refereed journals through the COMPS program alone he is an expert on the circulation dynamics of the west Florida coastal ocean.

Key Team member: Lianyuan Zheng, PhD Physical Oceanography
Dr. Zheng has over 10 years of oceanographic research experience with a focus in circulation and water quality modeling.

Key Team member: Yonggang Liu, PhD Physical Oceanography
Dr. Liu has over 10 years of oceanographic research experience with a focus in circulation modeling and data assimilation studies.

15. Environmental and/or Economic Benefits - Describe environmental and/or economic benefits of the project.

Environmental Benefits:

Water properties are determined by physical, biological and chemical connections that occur across space, time and trophic levels. Coastal ocean environmental stewardship is predicated on understanding this complex system functionality and applying that understanding toward prediction in a quantitative, scientifically defensible manner. Only in this way can forecasts be made regarding the consequences of either human or natural occurrences. Understanding the coastal ocean ecosystem begins with understanding the coastal ocean circulation because the circulation sets the background state for all else. Five recent examples of this are: 1) our emergent ability to forecast the occurrence (2014) or lack of occurrence (2010 and 2013) of WFS HABs, 2) our explanation of gag grouper recruitment success, 3) our explanation of WFS fish lesions and liver chemistry anomalies subsequent to the Deepwater Horizon oil spill, 4) the use of our model trajectory forecasts by NOAA during the Deepwater Horizon event itself and 5) our numerous briefings to emergency management and private citizen groups on hurricane storm surge and wave risks. The environmental benefit is thus improved, scientifically defensible environmental stewardship of value to county, state and federal agencies and the general public.

Economic and Social Benefits:

As a peninsula nearly surrounded by water there is little of the Florida economy that is not influenced by the ocean. Inland agriculture is even influenced by land-sea breeze and the ensuing rainfall. Tourism, in particular, is related in large measure to the attraction of the sea and Florida's bountiful living marine resources. The understanding of ecosystem functionality begins with observations used in conjunction with predictive models. Matters of real property and personal safety under extreme conditions require the ability to track storm systems, forecast storm surge and waves and provide information for use by emergency managers. Direct near real time observations of winds, waves and currents, along with the associated model forecasts that these observations facilitate are important for recreational and commercial boaters and fishers to inform safe and successful outings. Understanding Gulf and estuary ecosystem functionality is also critical for assessing and measuring environmental and

social impacts caused by either human-induced or natural variations. Direct employment will include technical and scientific staff related to operations and related science. Indirect employment will derive through improved tourist attraction by facilitating improved environmental stewardship. These COMPS data and models plus the high resolution Tampa bay and vicinity model proposed here will also serve the present and next generation of students through outreach, education and training.

16. Technical Feasibility - Describe technologies and relevant past experience or proven success with similar projects.

The proposed high resolution Tampa Bay model presently exists, two papers are already published in professional refereed literature and a third is in review (model development was the PhD dissertation of Jun Zhu, a former USF-CMS graduate student under the supervision of the PI, Professor Robert H. Weisberg). It is the implementation as a nowcast/forecast model that remains to be done, and we are experienced in doing this. Thus, everything proposed is technically feasible using existing, proven capabilities. Development time is not required.

17. Public Acceptance - Describe any known or potential public approval or opposition to the project.

A common theme of public input from Gulf Restoration Council hearings in 2013 was the call for a system that provides observations from the deep waters of the Gulf of Mexico to the coastal region to assist in resource management, protect lives and property and sustain a healthy environment. One need only observe a map of the entire Gulf to realize that COMPS fills a critical gap for Florida's west coast, which constitutes a significant portion of the continental shelf waters of the Gulf of Mexico. Additionally, COMPS has demonstrated public acceptance by the use of COMPS real time data and model products. USF scientists, in collaboration with county, state and federal officials, will actively seek to engage more public stakeholders in the use of the proposed information. The coastal ocean is where society meets the sea, and we are committed to contributing our scientific expertise to the benefit of society.

18. Project Activity Budget Justification:

Provide the total project cost and costs by identified tasks for the following items. Provide specific justification for all that apply.

The estimated cost is based on a 5-year project duration, and the budget is broken into three phases. Phase 1 occurs in year 1 and it consists of implementing our existing Tampa Bay estuary model as an automated, daily nowcast/forecast. The phase 1 cost is $121,921. Phase 2 occurs over years 2 and 3. It adds a water quality sub-model, and it also reinstitutes a coupled wave model that we had to abandon this past year for lack of support. The phase 2 cost is $413,432. Phase 3 is the sustaining part in which we will seek additional partners and applications.

Tampa Bay Modeling Budget

Notes: Fringe @ 0.1644 + 1264/mo. on faculty
@ 0.0165 + 4495/yr. on post-docs
@ 0.005 + 2161/yr. on graduate students
Indirect @ 0.15 on total direct costs

Budget (USF)	FY15	FY16	FY17	FY18	FY19
Salary					
a. R. Weisberg	15,900	16,400	16,900		
b. L. Zheng	8,100	16,200	16,700	17,200	17,800
c. J. Donovan	34,600	35,600	36,700	37,800	38,900
d. Post-Doctoral Assoc.		45,000	46,300	47,700	49,100
d. G.S.			23,000	24,000	25,000
Total Salaries	58,600	113,200	139,600	126,700	130,800
Fringe	17,218	25,298	27,940	24,189	23,233
Salary+Fringe	75,818	138,498	167,540	150,889	154,033
Equipment	12,000	6,000	6,000		
Travel					
a. Domestic	3,500	3,500	3,500	3,500	3,500
b. Foreign					
Total travel	3,500	3,500	3,500	3,500	3,500
Materials and Supplies					
a. PCs	3,000	3,000	3,000	3,000	
b. Laptop	1,200		1,200	1,200	
c. Data storage	4,500		4,500	4,500	
Total supplies	8,700	3,000	8,700	8,700	
Other					
a. Publication	6,000	6,000	6,000	6,000	6,000
b. Tuition			10,771	10,771	10,771
Total Other	6,000	6,000	16,771	16,771	16,771
Direct Costs	106,018	156,998	202,511	179,860	174,304
Indirect Costs	15,903	23,550	30,377	26,979	26,146
Total Costs	121,921	180,548	232,888	206,839	200,450

Total costs, 5-years: 942,646

- Personnel and fringe: $686,778
- Travel including the number of trips and estimated cost per trip: $17,500 ($3,500)
- All equipment greater than $1,000: $85,200
- Supplies including a list of major types of supplies: $53,100
- Contractual costs: N/A
- Administrative costs not to exceed 3% of the total award:

19. Describe how the project will utilize a collaborative approach that incorporates partnerships, if applicable.
(Step 2 - Criterion 8)
List any project partners and briefly describe their involvement and contribution to the project.

We would pursue a partnership with NOAA to transition our model into their TBOFS. We would also seek agency partnerships on matters such as fish larvae recruitment, harmful algae blooms, search and rescue, engineering assessments of permitting applications, all while providing relevant information to the general public for use in recreational outings such as paddle boarding, kayaking, sailing, fishing etc.

20. Describe how the project will support, further, or help implement one or more Pinellas County Comprehensive Plan Element goal(s) as identified in the overarching project goals, if applicable. Clearly list each Comprehensive Plan Element goal addressed.
(Step 2 - Criterion 9)
Link to Applicable Comprehensive Plan Element Goals:
www.pinellascounty.org/restore/pdf/comp-plan-goals.pdf

- **Future Land Use and Quality Communities Element: Goal Three**
  Pinellas County shall promote a balanced relationship between the natural environment and development
  This goal is furthered by all COMPS modeling efforts. As described in detail previously, the COMPS program is by definition the monitoring of the natural environment that is the coastal ocean. By increasing our knowledge of Tampa Bay circulation we assure that we remain ever vigilant and prepared in the event of any future man-made or naturally occurring harmful substance events.

- **Natural Resources Conservation and Management Element: Goal Four**
  Strengthened connections to the water – Pinellas County will remain a leader in the restoration of its surface waters and the dependent habitats and resources which are essential to this county's character, economy and quality of life
  Again, as previously detailed the COMPS program goal is to observe, describe and predict the coastal ocean circulation and how it contributes to coastal ocean ecology. The importance of

circulation as a driving factor in estuarine ecology is unfortunately not a priority for other sources of RESTORE funding. Pinellas County has the opportunity to be a true leader in recognizing and supporting the value inherent to the COMPS program in observing and forecasting coastal ocean circulation and its myriad effects on ecology and the environment.

- **Recreation, Open Space and Culture: Goal Three**
  Strengthening Connections to the Water – To strengthen public connections to Pinellas County waters and waterways through the maintenance, promotion and environmentally sensitive expansion of recreational spaces
  Tampa Bay waters are utilized by the public for a multitude of recreational activities including paddle boarding, kayaking, boating, fishing, swimming etc, and is a major attraction for leisure activities for residents and tourists alike. The proposed high resolution model served to the public informs safe and successful recreational outings in our beloved bay.

21. Describe the benefits the project will provide, for how long, and why:
(Step 2 - Criterion 10)
Benefits may be economic, social, and/or environmental. Explain how the benefits will or could be identified, assessed, and/or measured. Describe and quantify environmental and/or economic benefits as applicable [e.g., area restored (acres, linear feet), improved ecosystem services, jobs created/preserved, pollutants and/or nutrients removed (e.g., kg, pounds, tons)].

In the short term the proposed high resolution model will provide the public with more useful circulation data than previously possible that will allow for informed decisions regarding activities on or near the coastal waters. This same principle applies to commercial endeavors such as shipping. The primary long term benefits of the model project begin with a better understanding of Tampa Bay circulation in general. Advancing knowledge of the estuarine circulation of Tampa Bay advances our understanding and thus our predictive capabilities regarding the health of the Tampa Bay ecosystem as well. It allows us to assess our ecosystem vulnerabilities and therefore to better protect it when possible and when not possible to anticipate the effects of harmful substance events. Of lasting benefit is the advancement of knowledge as it pertains to coastal ocean science and the ability to share and apply that knowledge to other geographic regions through scientific publications and collaborations.

22. Possible material risks to implement and maintain the proposed activity:
List possible material risks, e.g., operational, legal, regulatory, budgetary or ecological. Include brief description of mitigation strategy to address each identified risk.

No material risks exist.

23. Best Available Science:

Models are only as good as the underlying science. This project builds upon a long history of scientific applications to the west Florida coastal ocean and Tampa Bay. The WFCOM in which the high resolution Tampa Bay and vicinity model will be nested is a state of the art coastal ocean model. Recent peered reviewed publications using this model explained why there was no red tide bloom along Florida's west coast in 2010, how gag grouper juveniles get from offshore spawning to near shore settlement sites and why fish lesions were prominent on the

west Florida continental shelf after the Deepwater Horizon spill. Specific to Tampa Bay are two recent publications using the proposed model explaining how Tampa Bay and specific sub-regions flush and also examining what might occur if the shipping channels were to be deepened and widened to accommodate larger vessels. Prior to that, our research group published the first paper on a three-dimensional, density dependent circulation model for Tampa Bay to appear in a truly refereed professional journal. All of these examples are provided in the reference list. In summary, COMPS observations and models are all based on state of the art equipment and models and COMPS work regularly appears in refereed professional journals. By applying best available science we regally contribute to the understanding and prediction of societally relevant coastal ocean phenomena as well as providing useful real time information to the general public.

24. Matching/Other funding

(Step 2 - Criterion 11) *Indicate:*

- The amount and percent of the total project cost secured and the source of each matching fund secured. Restore Act funds can be matched with other federal sources of funding.
- If matching funds are not secured, specify the amount of matching funds requested or expected.
- The date the amount of secured funds will be known.
- Future costs related to maintaining the project, the funding source, and responsible entity.

Matching funds will be requested through the NOAA IOOS South East Coastal Ocean Observing Regional Association (SECOORA) in 2016 as new funds become available. Some salary support is provided for through the USF College of Marine Science.

Readiness for Implementation

(Step 3)

Complete the following:

25. Will the project be completed within 5 years from date funding is confirmed?

Yes: X No:

It is anticipated that once demonstrated the model will be able to be sustained through other funds beyond the 5-year interval proposed here, and possibly even before.

26. Identify each project milestones and proposed duration (no. of months) to complete each step and the total number of months or years to complete the project.

The high resolution Tampa Bay model as proposed already exists in a hindcast mode. Implementation as a nowcast/forecast model is what remains to be completed. The first milestone would be nesting the existing high resolution model into the existing WFCOM and

testing the various real time data streams necessary to run daily nowcast/forecasts. Acquisition of a dedicated computer server is also required. We estimate that this initial milestone will be completed during the first year. Testing of both hindcast simulations and nowcasts/foreasts will continue throughout the project duration. A year two milestone will be to quantify the veracity of these nowcast/forecasts and to gauge them against all available observations and other model simulations such as those produced by NOAA TBOFS, a much lower resolution model for which we know from prior experience does not have the same capabilities of what we are proposing. Throughout this time we will also be exploring scientific questions regarding fisheries recruitment as already begun with earlier versions. We anticipate that such explorations will lead to research grants that can help in the long run to sustain our project beyond the five year duration proposed and possibly even earlier to alleviate some operational costs included in the 5-year budget. Improving information dissemination to the general public will be an ongoing objective as will be collaborating with all agencies who may have need or use for the information being generated.

27. How long before the project can start after funds are available (months)?

The project can start immediately.

28. Describe project design work, permit requirements and hurdles (federal, state, or local), and/or permitting that is in progress *(attach applicable permits or design work).*

Not applicable.

29. Describe any issues or reasons that may delay project start or completion.

None.

END OF QUESTIONS

Additional Information

Tables and Figures:

1. Table 1. 5 Year Budget.
    - https://drive.google.com/file/d/0B5PGt0arj3QZUWp2QmI0VVJMS00/view?usp=sharing

Online Data and Product Sources, and tracking tools:

1. Collaboration for Prediction of Red Tides (CPR). Tracking tool in partnership with FWC to help federal, state and local end users monitor and manage red tide blooms on the west Florida shelf.
    - http://ocgweb.marine.usf.edu/hab_tracking/HAB_trajectories.html
2. COMPS program homepage. All real-time sites shown on interactive map for simple, clickable access to current ocean-atmosphere observations.

- http://comps.marine.usf.edu/

3. Ocean Circulation Group homepage. Interactive website displaying OCG monitoring and modeling efforts.
    - http://ocgweb.marine.usf.edu/
4. SECOORA regional association homepage. COMPS data is displayed in real-time.
    - http://secoora.org/
5. GCOOS regional association homepage. COMPS data is displayed in real-time.
    - http://data.gcoos.org/

Relevant Publications: Recent

1. Weisberg, R. H. (2011). Coastal Ocean Pollution, Water Quality, and Ecology. MTS Journ., 45(2), pp. 35-42.
    a. https://drive.google.com/file/d/0B5PGt0arj3QZdDloX0RfVW1UQzg/view?usp=sharing
2. Weisberg, R. H., Zheng, L., Liu, Y., Lembke, C., Lenes, J. M., Walsh, J. J. (2014). Why no red tide was observed on the West Florida Continental Shelf in 2010. J. Harmful Algae, 38 (2014), pp. 119-126.
    - http://www.sciencedirect.com/science/article/pii/S1568988314000572
3. Weisberg, R. H., Zheng, L., Peebles, P. (2014). Gag grouper larvae pathways on the West Florida Shelf. Cont. Shelf Res., 88 (2014), pp. 11-23, doi.10.1016/j.csr.2014.06.003.
    - http://www.sciencedirect.com/science/article/pii/S0278434314002027
4. Weisberg, R. H., Zheng, L., Liu, Y., Murawski, S., Hu, C., Paul, J. (2014). Did Deepwater Horizon hydrocarbons transit to the west Florida continental shelf? Deep-Sea Res., Part II, doi:10.1016/j.dsr2.2014.02.002.
    - http://www.sciencedirect.com/science/article/pii/S0967064514000356
5. Zheng, L. and R.H. Weisberg (2012), Modeling the West Florida Coastal Ocean by Downscaling from the Deep Ocean, Across the Continental Shelf and into the Estuaries, *Ocean Modeling*, 48 (2012), 10-29, doi:10.1016/j.ocemod.2012.02.002.
    - http://www.sciencedirect.com/science/article/pii/S1463500312000327
6. Huang, Y., Weisberg, R. H., Zheng, L. (2010). Coupling of surge and waves for an Ivan-like hurricane impacting the Tampa Bay, Florida region. J. Geophys. Res., 115, C12009, doi:10.1029/2009JC006090.
    - https://drive.google.com/file/d/0B5PGt0arj3QZVXFzcXpUNk1lbG8/view?usp=sharing

Relevant Publications: Florida Estuaries

1. Weisberg, R.H. and L. Zheng (2003). How estuaries work: a Charlotte Harbor example, *J. Mar. Res*., 61, 635-657.
    - https://drive.google.com/file/d/0B5PGt0arj3QZVGVSZTljS19zZjQ/view?usp=sharing
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