#115

FORM CD-450
(REV 01/09)

U. S. DEPARTMENT OF COMMERCE

FINANCIAL ASSISTANCE AWARD

☐ GRANT ☒ COOPERATIVE AGREEMENT

AWARD NUMBER
NA10NMF4540108

RECIPIENT NAME	Gulf and South Atlantic Fisheries Foundation, Inc.
STREET ADDRESS	5401 W. Kennedy Blvd., Suite 740
CITY, STATE, ZIP CODE	Tampa FL 33609-2447
AWARD PERIOD	08/01/2010-07/31/2011
FEDERAL SHARE OF COST	$237,533.00
RECIPIENT SHARE OF COST	$0.00
TOTAL ESTIMATED COST	$237,533.00

AUTHORITY 16 U.S.C. 661; 16 U.S.C. 742(f)

CFDA NO. AND PROJECT TITLE
11.454 Continued Development and Assessment of Bycatch Reduction Devices within the Southeastern Shrimp Trawl Fishery

This award offer approved by the Grants Officer constitutes an obligation of Federal funding. By accepting this award offer, the Recipient agrees to comply with the award Terms and Conditions checked below. If this was a paper issued award offer, please send two signed documents to the Grants Officer and retain one set of signed award documents for your files. If this award offer is not accepted without modification within 30 days of receipt, the Grants Officer may unilaterally withdraw this award offer and de-obligate the funds.

- ☐ Department of Commerce Financial Assistance Standard Terms and Conditions
- ☒ Government Wide Research Terms and Conditions
- ☒ Bureau Specific Administrative Standard Award Conditions
- ☒ Award Specific Special Award Conditions
- ☒ Line Item Budget
- ☒ 15 CFR Part 14, Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, Other Non-Profit, and Commercial Organizations
- ☐ 15 CFR Part 24, Uniform Administrative Requirements for Grants and Agreements to States and Local Governments
- ☐ OMB Circular A-21, Cost Principles for Educational Institutions
- ☐ OMB Circular A-87, Cost Principles for State, Local, and Indian Tribal Governments
- ☒ OMB Circular A-122, Cost Principles for Non-Profit Organizations
- ☐ 48 CFR Part 31, Contract Cost Principles and Procedures
- ☒ OMB Circular A-133, Audits of States, Local Governments, and Non-Profit Organizations
- ☒ Department of Commerce Pre-Award Notification Requirements for Grants and Cooperative Agreements
  REF: 73 FR 7696 (February 11, 2008).
- ☒ Other(s)
  74 FR 34642 (July 16, 2009)

SIGNATURE OF DEPARTMENT OF COMMERCE GRANTS OFFICER	TITLE	DATE
Tracy Jackson	Grants Officer	07/22/2010
TYPE NAME AND SIGNATURE OF AUTHORIZED RECIPIENT OFFICIAL	**TITLE**	**DATE**
Judy Jamison Judy Jamison	Executive Director	08/10/2010

COOPERATIVE RESEARCH PROJECT SUMMARY

Project Title: Continued Development and Assessment of Bycatch Reduction Devices within the Southeastern Shrimp Trawl Fishery

Project Status/Duration: Sept. 1, 2010 – Aug. 31, 2011 New X Cont'd _ Proj. Period: 12 Months

Name, Address, and Telephone Number of Applicant:

Gulf & South Atlantic Fisheries Foundation, Inc.
Lincoln Center, Suite 740
5401 W. Kennedy Blvd.
Tampa, FL 33609-2447
(813) 286-8390

Principle Investigator(s) and Brief Statement of Qualifications:

Ms. Judy Jamison: Over 29 years administrative and grants management experience.
Mr. Frank Helies: Experience in biological and oceanographic research.

Project Objectives:

(1) Solicit and test new and/or promising BRDs that show potential for reducing the quantity of bycatch incidentally harvested during shrimp trawling efforts; (2) Quantify the bycatch reduced by new and/or promising experimental BRDs within the EEZ of the Gulf of Mexico and South Atlantic; (3) Calculate reduction rates achieved for each BRD tested to include total shrimp, finfish, and total bycatch, and estimate red snapper fishing mortality (F); (4) Increase the shrimp industry's participation in BRD research and development to enhance awareness and involvement in fisheries management; and (5) Provide improved data collection on the extent of bycatch of small coastal sharks in the Gulf shrimp fishery, particularly blacknose shark (*Carcharhinus acronotus*) and smalltooth sawfish (*Pristis pectinata*).

Specific Priority(ies) in Solicitation to Which Project Responds:

4. Commercial Shrimp Harvest, **b.** Quantification of effort; **c.** Bycatch Reduction Device Testing Protocols; **d.** Quantification of Bycatch Rates.

Summary of Work:

This project will field test new or promising bycatch reduction devices (BRDs) for certification following the NMFS BRD Certification Testing Protocol for the Gulf of Mexico and South Atlantic. BRD designs will be solicited from shrimp fishermen, industry gear innovators, Sea Grant Extension agents, and NMFS Harvesting Branch Personnel. Devices will be field tested aboard commercial fishing vessels with onboard observers collecting data outlined within the Testing Protocols. Collected data will be analyzed to identify the reduction in fishing mortality achieved by BRDs. To increase industry's involvement in the process of BRD research and development, the Foundation will solicit industry designed BRDs, contribute funds for industry BRD development, and reimburse the travel of industry members to Panama City to observe underwater hydrodynamic performance tests of fishing gear.

Project Funding:		
	Federal	$237,533
	Non-Federal	$ 0
	Total	**$237,533**

Project Title:

Continued Development and Assessment of Bycatch Reduction Devices Within the Southeastern Shrimp Trawl Fishery

Applicants Name:

Gulf & South Atlantic Fisheries Foundation, Inc.
Ms. Judy Jamison, Executive Director

Lincoln Center, Suite 740
5401 W. Kennedy Blvd.
Tampa, Florida 33609-2447
(813) 286-8390

Proposed Budget period:

September 1, 2010 – August 31, 2011

Project Goals and Objectives:

1.) Continue to solicit and test new and/or promising bycatch reduction devices (BRDs) that show potential for reducing the quantity of bycatch incidentally harvested during shrimp trawling efforts;

2.) Quantify the bycatch reduced by new and/or promising experimental BRDs within the EEZ of the Gulf of Mexico and South Atlantic;

3.) Calculate reduction rates for each BRD tested to include total shrimp, finfish, and total bycatch for certification purposes, and estimate red snapper fishing mortality (F);

4.) Increase the shrimp industry's participation in BRD research and development to enhance fisheries management awareness and involvement; and

5.) Provide improved data collection on the extent of bycatch of small coastal sharks in the Gulf and South Atlantic shrimp fisheries, particularly blacknose shark (*Carcharhinus acronotus*) and smalltooth sawfish (*Pristis pectinata*).

Identification of Problem:

Finfish bycatch is a contentious issue facing commercial fisheries worldwide and is defined as the discarded catch of a living marine resource, plus the retained incidental catch and unobserved mortality of a marine resource due to a direct encounter with fishing gear (NOAA, 1998). In the southeastern United States shrimp trawl fisheries, bycatch reduction technology (BRT) research has focused on excluding threatened or endangered species (ie. sea turtles - TEDs) and commercially/recreationally important species (ie. weakfish, Spanish mackerel, red snapper -

BRDs). Scientists and fishermen from the United States have pioneered this technology for shrimp trawls, and BRT is now being utilized across the globe (Brewer *et al*., 1998; Broadhurst, 2000; Eayrs *et al*., 2007; He *et al*., 2007; Krag *et al*., 2008). In the southeast U.S., while more and more stocks have been designated as overfished by the NMFS, bycatch reduction, particularly for the shrimp industry, has become a key management objective. Also, recent information suggests that blacknose shark (*Carcharhinus acronotus*) is overfished and that there is substantial shark bycatch in the Gulf shrimp fishery (NMFS, 2007). Some of these suggestions are disputed and will be addressed by this research through the collection of information on the bycatch of small coastal sharks. The Foundation has previously received funding to test new and promising BRDs (MARFIN Award No. NA08NMF4330406). This project looks to continue with a tested and proven method for eliciting industry participation and assistance in reducing bycatch in the shrimp trawl fishery.

With the decertification of the expanded mesh, the "fisheye" and the "Gulf fisheye" BRDs effective May 18, 2009, only three fully certified BRDs are available to Gulf fishermen; the Jones Davis, Modified Jones Davis and the Fisheye, placed no farther forward than 9 feet (Gulf) and 11 feet (S. Atlantic) from the cod end tie-off rings (Federal Register, 2008c). This coupled with the two year provisional certification period continued into 2010 for the Extended Funnel and the Composite Panel BRDs outlined in the recently revised BRD testing protocol (Federal Register, 2008a), continued testing of bycatch reduction devices for certification is critical to the future viability of the shrimp industry. These recent changes to the criterion for meeting bycatch reduction rates for both the Gulf and South Atlantic along with the decertification of the Gulf Fisheye (the most widely used BRD) have initiated a significant technology transfer within the southeastern shrimp trawl fishery. The following discussion describes the history of previous adaptations by the shrimp industry to modified regulations to address the issue of bycatch within the fishery and outlines the need for continued research.

The otter trawl revolutionized the commercial fishing industry by allowing fishermen to increase their catch-per-unit-effort (CPUE). A significant disadvantage to this gear is that it is non-selective with respect to catch. While fishermen direct their efforts at harvesting targeted species, other marine species are harvested as bycatch. Commercial shrimp fishermen of the southeastern United States have historically altered their fishing strategies and/or gear to reduce the harvest of non-target species. This has occurred through the use of increased mesh sizes to allow the escapement of small organisms and the integration of the "fisheye" and "cannonball shooter" (precursor to the TED) bycatch reduction devices (BRDs) into trawl net designs (Aparicio, 1999; Davis and Ryer, 2003). These gear designs were integrated into trawl nets prior to the implementation of national and regional bycatch regulations.

Although fishermen have voluntarily made efforts to reduce the quantity and composition of incidental harvest, bycatch mortality is thought to contribute largely to the overall fishing mortality of finfish species (Davis and Ryer, 2003). Stock assessments for red snapper (*Lutjanus campechanus*), weakfish (*Cynoscion regalis*), and Spanish mackerel (*Scomberomorus maculatus*) stocks indicated that incidental harvest by southeastern U.S. shrimp trawlers was a factor affecting fish populations (e.g., overfished). This information led to the implementation of BRD regulations for shrimp trawls operating in the Gulf of Mexico and South Atlantic EEZ (Federal Register, 1997; 1998; 2004).

In the past, five BRDs were certified for use in portions of the Gulf of Mexico and/or South Atlantic. These devices were the Gulf fisheye, fisheye, expanded mesh, extended funnel, and Jones-Davis. Most commercial shrimp fishermen used the fisheye or Gulf fisheye in trawl nets due to the low cost and simplicity of these devices. Previously, for a BRD to become certified, it needed to meet certification tests that specified a reduction in fishing mortality (F) for certain target species (e.g., red snapper, F = 44%; weakfish and Spanish mackerel, F = 50%). Target species were selected based on stock status (overfished), the extent to which the shrimp fishery impacted their populations, and the rebuilding strategies set forth for these species by the Regional Councils and NMFS.

Since the finalization of the first protocols, Spanish mackerel and weakfish populations within the South Atlantic are no longer characterized as overfished. With the reauthorization of the Magnuson-Stevens Act and the implementation of National Standard Number 9, bycatch, in all forms, must be minimized "to the extent practicable." This resulted in the South Atlantic Fisheries Management Council submitting an amendment to their Protocol to utilize a 30% finfish bycatch reduction as the sole criteria for BRD certification, in addition to transferring future responsibility for BRD certification to NMFS (Federal Register, 2005). Because BRDs currently certified for use within the Federal EEZ seem to be achieving the finfish reduction rates required by the South Atlantic Council and NMFS, there has been reduced effort focused on certifying new gear within the South Atlantic.

Bycatch issues within the Gulf of Mexico are more complex due to the continued overfished status of the red snapper stock. The NMFS Pascagoula Laboratory, under the auspices of the 1998 Red Snapper Initiative, conducted reevaluation studies on currently certified BRDs within the Gulf of Mexico shrimp fishery. The conclusions derived from this study indicated that the red snapper reduction achieved by the Gulf fisheye was lower than the finfish reduction originally used to certify this device (Foster, 2004). Further analysis on the configuration of fishing gear revealed that the cod end retrieval system (elephant ear) can obstruct the BRD opening and negatively affect finfish escapement (Foster, 2004). This information led to an amendment of the BRD regulations and disallowed the placement of the fisheye and Gulf fisheye BRDs in an area obstructed by the elephant ear (Federal Register, 1999).

BRD reevaluation efforts continued after the conclusion of the 1998 Red Snapper Initiative. From 2001-2003, onboard observers were contracted by NMFS and the Foundation to collect CPUE data aboard commercial fishing vessels operating within the Gulf of Mexico. A total of 4,089 tows were conducted with the cooperation of 32 commercial fishing vessels. Of these tows, 2,202 tows met the criteria for certification analysis. These criteria included (1) all paired tows with a functional BRD in the experimental net and a disabled BRD (or no BRD) in the control net, and (2) all successful tows (i.e., problem free; z-tows) with at least one red snapper present in one net. It is important to note that these criteria are not explicitly listed within the Manuals and that this is an alternate analysis.

Results from the 2001-2003 studies indicated that the red snapper F-mortality reduction achieved by the Gulf Fisheye was drastically lower (F = 11.7%) than that of the 1998 study and the original data used to certify the device (Foster, 2004). Also, performance of the Gulf Fisheye

was highly variable among vessels, but under no circumstance was the 44% reduction in red snapper fishing mortality achieved (Foster, 2004). Results also indicated that the Gulf Fisheye achieved a higher finfish reduction when placed closer to the tie rings or during net retrieval; a time in which shrimp loss can also be magnified. Due to the economic incentive of maintaining shrimp catch, it has been speculated that adaptations in fishing techniques used to increase shrimp retention (i.e., haul back speed/techniques, towing speed, cod end funnels, etc.) are also reducing the effectiveness of the fisheye and Gulf Fisheye BRDs. Gallaway and Cole (1999) published results suggesting that the Gulf fisheye BRD does not produce mortality reductions necessary to rebuild the red snapper stock. The results of these studies are of great concern to commercial shrimp fishermen since decertification of the Gulf fisheye BRD and the mandated use of other, more expensive and complex devices can add significant costs to their operating expenses. Furthermore, Amendment 27/14 to the Reef Fish and Shrimp Management Plans established a target reduction rate for juvenile red snapper mortality within the Gulf shrimp fishery of 74% from the baseline years of 2001-2003. Although a portion of this reduction is realized from reductions in effort from both hurricanes and global market forces, there will be a need for new viable bycatch reduction devices to meet target goals. To facilitate the certification of new gears, the Gulf of Mexico Fishery Management Council, like the South Atlantic Council, approved a regulatory amendment to revise BRD criterion to a 30% overall reduction of finfish bycatch into amended/revised BRD Certification Protocols.

Changes to the revised protocol have standardized the criteria for bycatch reduction devices such that they now must meet the criteria of 30% total finfish reduction by weight for both the South Atlantic and Gulf of Mexico (Federal Register, 2008a). In addition, the protocol identifies currently certified BRDs and those that meet the provisional certification of a successful reduction of total finfish bycatch by at least 25 percent by weight. BRDs that are currently certified include: Fisheye (placed no farther forward than 9 feet from the tie-off rings), Jones Davis and the Modified Jones Davis. In addition, two BRDs, the Extended Funnel in the Gulf EEZ and the Composite Panel in both the Gulf and South Atlantic EEZs, have received provisional certification as they fall within 5% of the current criteria of total finfish bycatch reduction. With provisional certification, fishermen are allowed to utilize a BRD for two years to allow testing to determine if its reduction meet the certification criteria of 30%. With the recent publication of the final rule to decertify the Fisheye, Gulf Fisheye and Expanded Mesh (Federal Register, 2008c), there is an urgent need for new certified Bycatch Reduction Devices to be made available for use, especially in the Gulf of Mexico shrimp fishery, as the Gulf Fisheye was by far the most popular BRD in use.

Project Impacts/Results or Benefits Expected:

The Gulf & South Atlantic Fisheries Foundation, Inc. (Foundation) has been instrumental in BRD research and development (Hoar *et al*., 1992; GSAFFI, 1995; Branstetter, 1997; Jamir, 1999; Jamir, 2001; GSAFFI, 2002; Medici, 2004; Graham and Jamison, 2006; GSAFFI, 2008). Serving as the only regional research and development organization aimed at assisting the commercial fishing industries of the Gulf of Mexico and South Atlantic, the Foundation has developed a high level of credibility among the commercial shrimp fishing industry. By allowing the Foundation to continue their research and development efforts to reduce bycatch within the shrimp trawl fisheries, commercial fishermen will become actively involved in BRD

research and development, will be more trustworthy of the data or information generated aboard their vessels, and will be more accepting of those devices tested (e.g., fishermen will be more willing to utilize a device they helped certify). With greater industry "buy-in" achieved through the use of a device it helps certify, the greater the impact in reducing bycatch within the fishery (Campbell and Cornwell, 2008). Jenkins (2006) found that the most widely adopted BRDs are those that are cooperatively produced and modified by fishers.

The expected benefits and impacts of this proposed research can be divided into two separate categories, (1) resource user impacts, and (2) biological impacts. When considering the current state of the shrimp trawl fishery, revenue is a major concern. An influx of foreign, pond-raised imports has drastically reduced the price of shrimp since its zenith in 2000. Shrimp price, in combination with increased management restrictions, the effects of hurricanes, and fuel prices, has drastically reduced effort within the fishery (Haby *et al*., 2002). This project has the ability to increase the gross revenue of an individual shrimp fishing business by increasing product quality and reducing the resources (fuel and labor) necessary to harvest the product.

Shrimp quality has been a concern since antidumping petitions were filed by the Southern Shrimp Alliance. Due to reduced labor, land, and environmental costs associated with the production of foreign, pond-raised product, the visual quality of the product being imported into the U.S. is perceived by some to be superior to that of the domestic wild-harvest product. Although culinary presentation is a major factor affecting the price and demand for a seafood product, so is taste. One way in which pond-raised product cannot compete with domestic product is taste – domestic product is highly sought after by chefs and restaurateurs (Miget *et al.*, 2004). An increased amount of bycatch associated with shrimp trawl fishing has a negative impact on the quality of a shrimp and can result in uropod breakage (e.g., the shrimp being 'smashed' by the total catch within the trawl cod end). Increased bycatch also extends product cull time. Shortening cull time would allow the crew to take preventative measures against spoilage, thus increasing shelf life of the product. An increased product quality associated with a decrease in bycatch, combined with the taste of domestic, wild-caught product, could generate greater revenue for shrimp fishermen.

Revenues could also be increased by decreasing the amount of fuel needed to harvest shrimp. During shrimp trawling operations, the cod end accumulates a greater quantity of catch over time (both target and non-target species). Greater amounts of bycatch within the cod end increases the size and weight of the trawl net, thus necessitating more power to drag the trawl nets, e.g., an increase in fuel consumption. By reducing the quantity of bycatch caught in the shrimp trawl, the size and weight of the cod end is reduced and allows the vessel to trawl at normal speeds while decreasing fuel consumption, and lowering the vessels' carbon footprint. Decreased fuel consumption reduces the price associated with the harvest of the product thereby increasing revenues for the vessel owner, captain, and crew.

Biological impacts associated with the reduction of bycatch are more evident. An overall reduction will create significant positive cascading effects on faunal assemblages within both top-down and bottom-up controlled ecosystems. These effects have extensive direct and indirect impacts on population and foodweb dynamics (Goni, 1998). The mortality reduction achieved by newly certified BRDs will allow Federal and State fishery management agencies to enhance

finfish populations, especially those potentially impacted by shrimp trawl fishing. Successful completion of this project will also add to the overall success of the national bycatch reduction program.

Project results also have the potential of impacting global fisheries. Cooperative research conducted by the Foundation, the southeastern shrimp fisheries, and NMFS has led to international efforts to reduce sea turtle mortality. As of August 31, 2004, turtle excluder devices (TEDs) are compulsory for all foreign, wild-harvest shrimp fishing fleets wanting to import shrimp into the US market. Non-compliance with this regulation can result in an embargo of the foreign-harvested product. Since bycatch is a contentious issue worldwide, the same import regulations could be imposed for the reduction of finfish bycatch. The continued efforts of southeastern shrimp fishermen to refine and design BRDs will assist in the global problem of incidental bycatch and further define the U.S. shrimp fleet as international innovators in fishing gear technology.

Historically, BRD programs have been relatively strong on the technology component, but weak in the area of communication/technology transfer strategy. Development of the latter becomes easier as industry leaders and innovators get involved in the BRD certification process. The benefits that accrue as a result of the direct cooperation and contribution of numerous fishermen in this project are important as they give the members of the fishing industry the opportunity to take ownership of research that may lead to the development of certified BRDs or fishery management strategies (Campbell and Cornwell, 2008). Industry involvement will also serve as a conduit to integrate other fishermen into the management process. Many commercial fishermen are unaware of how, when and where fisheries related research is conducted. This project will help familiarize fishermen with the management process and make the necessary connections (either through the Foundation, Councils, or NMFS) to stay active in the process.

Need for Government Assistance:

Decertification of the Gulf Fisheye BRD brings about an urgent need to provide additional certified BRD gear for use within the shrimp fishing community. The successful completion of this project will likely result in the certification of new, operationally simple BRDs within the southeastern U.S. shrimp trawl fisheries. As outlined in National Standard 9 of the Magnuson-Stevens Conservation and Management Act (MS-FCMA) [16 U.S.C. 1826c, 1851], i.e., "*Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.*" Bycatch reduction remains a critical and high priority issue. Additionally, this project will address several priorities outlined within FY-2010 Cooperative Research solicitation (e.g. Section 4. Commercial Shrimp Harvest; b. Quantification of effort; c. Bycatch Reduction Device Testing Protocols; d. Quantification of Bycatch Rates), and those outlined within the Cooperative Bycatch Plan for the Southeast. U.S. fisheries resources and marine ecosystems are a public commodity and, as such, are managed by the United States Government. The research outlined within this proposal has the potential of impacting the commercial fishing industry, state and federal fisheries management agencies, seafood consumers, recreational anglers and the public-at-large. Given the extent of the benefits gained from this project by interest groups, it is fair and reasonable to ask for federal assistance to conduct this study.

Statement of Work:

Proposed Budget Period:

September 1, 2010 through August 31, 2011

Objectives and Procedures:

Pre-Certification Activities:

The Foundation will solicit BRD designs and/or prototypes from the shrimp industry, net designers/fishing gear construction shops, NMFS (Pascagoula Laboratory) fishing gear experts, and various Sea Grant/Marine Extension fishing technologists. Because this project is a continuation of previous Foundation research, the pre-screening process will be conducted by the Foundation Regional Coordinators. They will use their vast expertise, along with consultation with NMFS, to determine those devices that show the greatest potential of reducing finfish bycatch. Limited funds will be made available to the developer to allow construction and or modification of the device.

Previous field testing efforts conducted by the Foundation have revealed that certain BRD designs show greater potential than others at reducing finfish bycatch (Cooperative Agreement Nos. NA17FF2009 and NA87FM0221). These gears include the C.J. Kiffe and the Double Opposed Fisheye. Although these devices were tested during previous field efforts, variance between tows and trips was large. To reduce variance, additional data are necessary. Additionally, the participation of industry at NMFS annual hydrodynamic tests and conversations with NMFS personnel has revealed other devices that may be successful candidates for testing. These devices include mixed mesh nets (trawl nets with 2"-4" top panels and standard mesh floor and wings), T-90 cod ends (large mesh turned 90^{o}), the Coulon TED/BRD, and 2" bar spacing for TEDs.

Criteria for Vessel Selection and Vessel Compensation:

After the experimental devices are identified, Foundation staff and Regional Coordinators will seek fishing vessels and captains willing to participate in the field testing of these experimental bycatch reduction devices. Although vessel selection will be non-random, all efforts will be made to utilize vessels whose captain and crew are attentive to their gear. This will ensure that a greater number of tows conducted are "problem free" and thus usable in any and all analyses. The Foundation will make available to cooperating fishing vessels funds that will cover or offset the costs of materials, labor, and shrimp loss associated with the development and evaluation of experimental BRDs. Fishing vessel owners who agree to cooperate in this project will be compensated $200/day while testing the device and $50/day when cruising to and from fishing grounds or no tow days.

Observer Training, Permits, and Insurance:

All contracted fishery observers will have undergone specific and detailed training prior to their deployment on any commercial fishing vessel. It is the responsibility of the Observer Coordinator to schedule and train all fishery observers. Training details all administrative and programmatic procedures necessary to conduct the proposed research listed below. This includes (but is not limited to): overview of the data collection protocols outlined within the Manuals, review and identification of all fauna harvested during shrimp trawling efforts (classroom and at-sea education), identification of sea turtles and proper handling/tagging procedures, description of fishing gear, and best practices while aboard a commercial fishing vessel. In addition, all observers will undergo marine safety training that outlines the procedures on how to respond properly to a variety of situations that could be encountered during experimental tests (e.g., man overboard drills, firefighting, radio communication, etc.). Each observer will also be certified in first-aid and CPR. Due to changes in NMFS policies regarding the certification of fishery observers, each observer will undergo extensive sea turtle training by NMFS that outlines methods for the collection of biopsy samples and the tagging of individual sea turtles (flipper tags, PIT tags, etc.), however, observers will only be required to tag sea turtles with flipper tags. At the conclusion of observer training, individual observers are certified by NMFS.

The Foundation will secure all special permits required to test experimental BRDs onboard a commercial shrimp fishing vessel. These permits may include a Letter of Authorization from the NMFS-Southeast Regional Office allowing the testing of experimental devices within the federal EEZ and all necessary permits required to conduct experimental tests in state waters.

Vessel liability insurance will be secured and funded by the Foundation prior to any observer being placed onboard a participating vessel. Insurance protects the vessel owners in the event of a catastrophic incident resulting in the injury of a fishery observer.

Field Data Collection:

The Foundation will work cooperatively with commercial shrimp fishing vessels to ensure that all tests are conducted according to protocols and guidelines outlined in the following documents:

1.) “Shrimp Trawl Bycatch Research Requirements”. November 1991. Published by U.S. DOC/NOAA/NMFS, Southeast Fisheries Science Center (Miami) and Southeast Regional Office (St. Petersburg).

2.) “A Research Plan Addressing Finfish Bycatch in the Gulf of Mexico and South Atlantic Shrimp Fisheries”. August 1992. Published by the Gulf & South Atlantic Fisheries Foundation, Inc. with support of NOAA/NMFS under Cooperative Agreements NA17FF0233-01 and NA17FD0103-01.

3.) "Shrimp Trawl Bycatch Characterization Sampling Protocol Manual for Data Collection". September 1992. Published by U.S. DOC/NOAA/NMFS, Southeast Fisheries Science Center (Galveston).

4.) "Evaluation of Bycatch Reduction Devices Sampling Protocol Manual for Data Collection". September 1992. Published by U.S. DOC/NOAA/NMFS Southeast Fisheries Science Center (Galveston).

5.) "Bycatch Reduction Device Testing Manual". 2008. Published by NOAA/NMFS Southeast Regional Office, St. Petersburg, FL, Galveston Laboratory, Galveston, TX and Mississippi Laboratories, Pascagoula, MS.

Extensive descriptions of the sampling protocols are contained in the above documents, and the reader is referred to them for such detail, especially the latest official NMFS/Regional Fishery Management Councils' approved protocol (e.g., finfish reduction as the sole criteria for BRD certification). Additional changes that NMFS may develop will be followed accordingly.

All observers (Foundation and NMFS) are trained to only sample tows that are free of problems, both gear and non-gear related. We believe that the definition of a "problem-free" tow is subjective and that a wide degree of variance is associated with what is or is not perceived as a problem-free tow. Torn or damaged gear, trawls subjected to mudding or bogging, mixing of trawl catches on deck in severe weather, insufficient cable, etc., all constitute problematic tows. The most common occurrence resulting in an un-sampled tow is the fouling of the tickler chain (Personal communication, Mr. Gary Graham). During training, Foundation contracted observers are instructed that any fouling of the tickler chain can result in a problem tow; this would include any material hanging from the chain (seaweed, a short shot of line, wire, etc.). Usually the observer receives input from the experienced captains or rig-men regarding discernment of potentially problematic tows. Foundation observers are made aware of this problem during training and reliable vessels' crews assist the observer with proper designation.

Assuming a 28% success rate for sampled tows, that the average shrimp fishing trip lasts 20 days, and that 3 tows are conducted per day, it would take 2.5 trips per device to collect the necessary number of tows needed to certify an experimental device (minimum of 30 tows; 20 days/trip x 3 tows/day x 2.5 trips/BRD = 150 tows/BRD; 150 tows/BRD x 28% of tows are sampled = 42.0 sampled tows). Although these assumptions are variable based upon geography and time of year, these figures provide a reasonable and average estimate of the fishing effort of the Gulf of Mexico shrimp fishing fleet. Therefore, 150 at-sea days of observer coverage are needed to accurately sample from 1-3 experimental devices (3 BRDs x 2.5 Trips/BRD x 20 days/trip = 150 at-sea days). We also anticipate that 16 cruising days are needed for vessels to travel to and from fishing grounds (2 days per trip). For each tow sampled, the contracted observer will gather a detailed set of information concerning gear configuration, location, time, and catch in accordance with the NMFS BRD Certification Testing Protocol Manuals. Although bycatch is a contentious issue for most U.S. commercial and recreational fisheries, due to the decertification of the Gulf Fisheye BRD within the Gulf of Mexico, the scope of the work outlined within this proposal will focus efforts on certifying experimental BRDs within the Gulf of Mexico shrimp fishery with minimal effort in the South Atlantic.

Participating commercial shrimp fishing vessels will tow identical trawl nets. Before any data are collected for experimental purposes, a maximum of 20 tuning tows will be conducted. This will ensure that no net or side bias exists. A minimum sample size of 30 successful tows per test is required. However, additional tows may be necessary for sufficient statistical power. A standard tow time will be defined for each experimental BRD/treatment. Only the outside trawl nets on a quad-rigged vessel will be used for experimental tests. The experimental BRD will be switched every 4-6 tows between the two outermost trawl positions and all efforts will be made to gain an equal number of tows from each side of the vessel.

The total catch of the control and experimental nets will be weighed separately. A '1-basket' (approximately 30 kg) sample (a standard NMFS sampling protocol aboard vessels) from both the control (without BRD) and experimental (with BRD) net will be collected. A predefined set of species (finfish and invertebrates) within these samples will be identified, counted, weighted as a species lot, and individuals of selected species will be randomly chosen and measured. All incidentally harvested red snapper will be enumerated, weighed, and measured to produce accurate abundance and size-frequency estimates. Also, all small coastal sharks and sawfish will be enumerated, weighed, and measured from each net. The total number of tows to be sampled per trip will depend upon the fishing activity of the vessel and the logistics of sorting the catch aboard a fishing vessel. (i.e., one sample may not be completed before the next sample is brought aboard, thus the next tow is not sampled). All data will be collected and recorded on OMB approved datasheets to allow for consistent data collection between NMFS and Foundation observers.

All efforts will be made to make the cooperating vessel captain and crew aware of the data collected by fishery observers. At the end of each tow or, at the least, the end of each day, the observer will explain the collected data to the vessel captain and crew and have all station sheets signed by the vessel captain.

Data Entry:

The Foundation will handle all data processing and analysis for this project. Upon completion of an experimental fishing trip, the observer and cooperating vessel captain will verify the accuracy/completeness of all data by signature. Observers will then be debriefed by the Foundation's Observer Coordinator and data reviewed for accuracy and completeness. All raw data will then be photocopied; originals will be forwarded to the Data Manager and the copies will be filed by the Observer Coordinator. Copies of all raw data, and any completed analyses of those data, will be made available to each BRD prototype originator.

The Foundation's contracted Data Manager will review and archive all data at the Foundation and in the NMFS Galveston Laboratory database system (as part of the overall bycatch program dataset). The Foundation's standardized data management procedure has been modified to accommodate NMFS' adoption of the database management system. Under this system, once the data files are entered by the Data Manager and verified as correct, the data are then archived in a pooled, multi-organizational dataset at the NMFS Galveston Laboratory. All archived data are available for download to Foundation personnel and contracted Data Analyst for final

analysis/interpretation. After the Data Manager completes the archive of data, all raw data will be sent to the Foundation's office for storage.

Data Processing and Analysis:

Methodologies for a standardized data analysis are outlined within the Manuals and publications listed above. These protocols have recently been questioned due to the severe data truncation that results through a strict interpretation, e.g., tow times having to be within +/- 10% of an average tow time, and a minimum capture of 5 red snapper in either the control or experimental net. Therefore, we propose a series of analyses.

The statistical analyses will consist of a Bayesian analyses, to determine if the BRD candidate meets the following conditions: (1) There is at least a 50–percent probability that the true reduction rate of the BRD candidate meets the bycatch reduction criterion (i.e., the BRD candidate demonstrates a best point estimate [sample mean] that meets the certification criterion); and (2) There is no more than a 10–percent probability that the true reduction rate of the BRD candidate is more than 5 percentage points less than the bycatch reduction criterion.

Species number and weight for the entire tow of the designated sample nets will be extrapolated using the ratio of the sample weight (or number) vs. the total net weight:

Equation 1:

$$\frac{(Sample\ Species\ Weight) \times (Total\ Net\ Weight)}{(Total\ Sample\ Weight)} = Extrapolated\ Sample\ Weight$$

These extrapolated values will then be converted into catch-per-unit-effort (CPUE) based on the hours towed:

Equation 2:

$$\frac{(Extrapolated\ Species\ Weight)}{(Tow\ Time\ in\ Hours)} = Catch\ Per\ Hour$$

These CPUE values will be compared between the "control" and "experimental" net for shrimp retention, total biomass reduction, finfish reductions, and red snapper reduction. Total biomass reduction will be calculated as:

Equation 3:

$$\frac{(BRD\ Net\ Weight - Control\ Net\ Weight)}{(Control\ Net\ Weight)} x\ 100\% = Percent\ Reduction$$

For the various species, reductions will be calculated by:

1. Extrapolation using Equation 1, the total weight (or number) of species taken in both the control and BRD net based on the weight (or number) of that species present in the sample tow;

2. Generating a CPUE using Equation 2;

3. Generating a mean trip CPUE (or other unit of measure) for both the Control and BRD net, and;

4. Calculating an overall percent reduction in the BRD net based on these means using the format of Equation 3.

The CPUE means will be tested for significant difference ($p<0.05$) through the use of paired t-tests according to the following hypotheses:

$$H_o: \mu_{control} - \mu_{BRD} = 0$$
$$H_a: \mu_{control} - \mu_{BRD} \neq 0$$

To illuminate the reduction in red snapper fishing morality achieved by experimental BRDs on a per trip and per gear basis, we will use the following equation:

Equation 4:

$$(0.3)(\%\ \text{Reduction Age 0 Fish}) + (0.7)(\%\ \text{Reduction Age 1 Fish}) = \text{F Mortality}^1$$

This equation is consistent with methodologies used by NMFS to compute the reduction in red snapper F-mortality achieved by BRDs (Foster, 2004). We define age-0 fish to be <130mm, and age-1 fish to be >130mm, but no larger than 300mm.

Although the standardized analysis listed within the Manuals (and above) was agreed upon to alleviate the weighting of any outliers within the data, it severely truncates the data used in the final analysis due to a lack of red snapper being caught in either the control or experimental nets, or tow times being outside the +/- 10% average. Therefore we also propose to analyze all collected data according to the analysis contained within a paper presented at the SEDAR-7 Data Assessment workshop (Foster, 2004). This analysis utilized the Manuals as a guidance document and allows for leeway during analysis. The analysis is standardized (e.g., the computation of CPUE and percent reduction is the same as listed above), but the criteria used to select data to include in the analysis is slightly modified and allows the use of all tows with one or more red snapper in either the control or experimental net as long as the tow duration is between 2 and 8 hours.

[1] Staff will verify these mortality rates are considered the most current and update accordingly as dictated by recent SEDAR.

When all datasets have been archived and analyzed, they will be reported in an aggregate summary where comparisons between and among the various BRDs can be more readily interpreted. Should the need arise, these results will be provided to appropriate fishery management agencies and organizations for certification. All data analyses will be conducted by the staff of LGL Ecological Research Associates, Inc. with oversight and comment by the Foundation's Program Director and Regional Coordinators.

Efforts to Increase Industry Participation:

The Harvesting Systems and Engineering Division of the NMFS Pascagoula Laboratory annually conducts hydrodynamic evaluations of commercial fishing gear. The purpose of these evaluations is multifaceted, but one objective is to increase the number of industry-designed gears certified for use within the commercial shrimp fisheries of the southeastern U.S. The Foundation and NMFS actively solicit industry members for new and innovative TED and bycatch reduction device (BRD) designs they believe will enhance the efficiency of commercial shrimp fishing operations while still allowing bycatch to escape shrimp trawl nets.

Gear submitted for hydrodynamic testing is brought to Panama City, FL, evaluated and recorded *in situ* by NOAA divers. Upon completion of individual gear tests, a video recording of the gear is mailed to the industry designer and allows the designer to assess and modify the gear if necessary. Due to funding limitations, gear designers are often absent during hydrodynamic tests and immediate feedback is impossible. Thus, if gear modifications are needed, the modified gear must be resubmitted and tested during subsequent years. This process is time consuming and slows development and possible certification of BRDs.

To assist in the research and development of BRD designs and to increase the commercial shrimp industry's participation in cooperative research, funds will be made available for three fishermen to attend hydrodynamic evaluations in Panama City, FL. Fishermen will be solicited by Foundation Regional Coordinators and staff to design and build new and innovative bycatch reduction devices. Fishermen will be compensated for time and labor and all materials needed to produce experimental devices and all participating fishermen will accompany their respective gear designs to Panama City and observe any and all tests that occur. By having the gear designer present during hydrodynamic tests, gear modification can occur in the field, expediting the assessment, modification, and certification of industry designed devices.

Participation by Persons or Groups Other Than the Applicant:

A project of this magnitude requires the cooperation and active participation of many organizations and individuals with close management by those experienced in federal grants administration. The Foundation has chosen to sole source contract with several persons in conjunction with this project. These essential personnel needed to complete project objectives are:

Mr. Gary Graham, Gulf of Mexico Regional Coordinator (Texas A&M Univ. Sea Grant)

Mr. Lindsey Parker, South Atlantic Regional Coordinator (UGA Marine Extension)

Mr. Daniel Parshley, Observer Coordinator

Mr. Phil Diller, Data Manager

Dr. Benny Gallaway (LGL Ecological Research Associates) and Staff, Data Analyst

1 Fishery Observer (To be contracted or solicited)

Mr. Robert Timmeney

Mr. John Williams, Southern Shrimp Alliance

Ms. Wilma Anderson, Texas Shrimp Association

Mr. Daniel Foster, Research Fishery Scientist, NOAA Fisheries Pascagoula Laboratory

The above individuals have been associated with other, similar, Foundation research programs and projects. Their continued involvement will provide stability and allow for a smooth progression into this project from both a management and performance perspective. However, if training for new observers is needed, funds have been outlined within the budgeted items to train new individuals.

Through years of experience, the Foundation has found that working closely with local Sea Grant – Marine Extension Service personnel (Mr. Graham & Mr. Parker), who have years of experience with the local fishing industry, is an efficient way to achieve rapid communication and cooperation with local shrimp fishermen through a historical fishery research and development framework. The Regional Coordinators will act as liaisons between the Foundation and vessel owners, establishing a good working relationship by relaying information about the project goals and securing vessel participation. All vessel information will be provided to the Observer Coordinator.

The Observer Coordinator will assist the Foundation Program Director and Regional Coordinator in their day-to-day activities related to this project and will coordinate all field efforts through constant communication with Foundation staff and contractors. The Observer Coordinator will recruit and train all observers. Prior to the deployment of a fishery observer, he will review with each observer all established protocols on how and what data to collect while onboard a participating vessel. He will also provide all necessary sampling and safety equipment and is responsible for reviewing all data for completeness prior to data entry.

Only observers that have undergone NMFS certification training will be contracted by the Foundation. This training will include safety training, onboard practices to avoid interference with the participating vessel captain and crew, turtle handling, sampling and tagging, data collection protocols (both classroom and at-sea training), and administrative protocols. It is the job of the fishery observers to collect all data from the experimental and control nets, ensure that all experimental gear is fished optimally (i.e., highly tuned nets), and proof all collected data for completeness and accuracy before being debriefed by the Foundation Observer Coordinator.

The Foundation currently has one contracted observer working on complementary projects. Because the above listed individual possesses the skills needed to fulfill the position and has proved himself under field conditions during other Foundation projects, the contracted observer position will be offered to this individual. If additional observers are needed to collect data and conduct experimental tests, observers will be solicited from other complementary Foundation projects or through a competitive process.

Observer collected data for this project will be electronically entered by a Foundation contracted Data Manager and archived at both the NMFS Galveston Laboratory and Foundation's Office. The Data Manager is responsible for checking and transferring all raw data into a manageable computer database for data archive. Once entered, the data will be forwarded to the Data Analyst (LGL Ecological Research Associates, Inc.) and Foundation Program Director.

The contracted Data Analyst will conduct all statistical tests on observer-collected data with overview from the Foundation's Program Director. Statistical tests will be varied and are listed below. The overall objective of the Data Analyst is to compute the reduction rates (shrimp, finfish, red snapper, and total catch) achieved by experimental BRDs. The Foundation will rely on the analytical and scientific skills of the Data Analyst to assist in any ancillary statistical tests (i.e., reduction rates achieved by experimental BRDs, etc.) that could be completed during the performance of this award. The NMFS Galveston Database Administrator will work closely with the Foundation's contracted Data Analyst, Data Manager and Program Director in this regard.

Direct industry participation is needed for the proposed work. All data will be gathered through the cooperation and direct participation of the commercial shrimp fishing industry of the Gulf of Mexico and South Atlantic regions. Without the cooperation of industry, this project would not be possible. The use of fishing vessels as research platforms, not only reduces the costs associated with this project, but ensures that industry is aware of the research and allows them to be involved in all steps of the scientific method. By allowing fishermen to actively participate in the collection of data, they will be more trusting of the results generated from this research and will be more willing to assist in future research.

Mr. John Williams, Executive Director of the Southern Shrimp Alliance and Ms. Wilma Anderson, Executive Director of the Texas Shrimp Association, will work with the Foundation to increase awareness of this project and solicit industry's support. Both Ms. Anderson and Mr. Williams have been active in the shrimp industry and related research for many years. Their contacts within the commercial fishing community will be of paramount importance.

The Foundation has historically worked cooperatively with staff and personnel at the NMFS Harvesting Systems and Engineering Division (Pascagoula Laboratory, Pascagoula, MS) to assist in the identification, pre-screening, modification, certification validation, and underwater hydrodynamic testing of various experimental BRDs. We propose to extend this cooperative participation during the award, collaborating on BRD development, testing and providing regular and frequent updates to allow for the close monitoring of this project.

Mr. Daniel Foster has agreed to be this project's NOAA Fisheries Cooperator. Mr. Foster has worked cooperatively with the Foundation for a number of years on fishing effort related projects. He will oversee the project throughout its entirety and ensure that all data is collected in a scientifically rigorous manor. The Foundation's Program Director and staff will have frequent contact with Mr. Foster and update him of any, and all, progress and/or problems that occur.

Project Personnel and Management:

Principal Investigators:

Ms. Judy Jamison, Executive Director
Mr. Frank Helies, Program Director

Foundation Staff:

Ms. Gwen Hughes, Program Specialist
Ms. Charlotte Irsch, Grants/Contracts Specialist
Administrative Assistant

Overall project quality control and assurance will be assumed by the Gulf & South Atlantic Fisheries Foundation, Inc. through its office in Tampa, FL. Foundation personnel will each spend 15% of their time over the course of the 12 month project period in the performance of this award. This percentage is similar (if not reduced) when compared to the overhead ('indirect rate') of academic institutions. A project of this enormity is time consuming and requires the attention of each Foundation employee. Qualifications of the Principal Investigators are highlighted in the attached resumes.

The Foundation's Executive Director, Ms. Judy Jamison, has ultimate responsibility for all Foundation administrative and programmatic activities, with oversight by the Foundation's Board of Trustees. She ensures timely progress of activities to meet project objectives and confirms compliance of all activities with NOAA/NMFS.

The Foundation's Program Director, Mr. Frank Helies, has overall responsibility for all technical aspects of Foundation projects and coordinates performance activities of all project personnel, including contractors. He confirms and evaluates the effectiveness of projects and subcontracts and ascertains timeframe for the project. Should alterations to the described experimental design or data collection protocols be necessary, he confirms that all data are collected in a scientifically rigorous manner to ensure the usefulness of all experimentally collected data. Additionally, he coordinates all analytical efforts, prepares all progress and final reports concerning project performance, and drafts the Foundation's quarterly newsletter.

The Grant/Contracts Specialist, Ms. Charlotte Irsch, is responsible for maintaining general financial accounting of all Foundation funds including all Cooperative Agreements and contracts, as well as communicating with NOAA Grants Management personnel, and assisting fiscal auditors in their reviews. She conducts/documents internal and program (single and desk)

audits, prepares backup documentation for fiscal audits, and drafts award extension requests (if applicable). Ms. Irsch provides the Executive and Program Directors with projected budgets concerning program performance and ensures that these budgets adhere to the proposed budget. Finally, she prepares the annual administrative budget, NOAA Financial Reports, and confirms compliance of all activities with NOAA/NMFS and OMB guidelines.

The Program Specialist, Ms. Gwen Hughes, is responsible for tracking programmatic activities, securing federal and state collection and experimental permits required for experimental testing, and individual scientific collection permits for contracted observers. She is also responsible for generating supporting documentation to assist in any and all programmatic audits. Ms. Hughes is responsible for the coordination of all program related workshops and auditing and paying program related invoices. She processes requests for reimbursement to conform with federal guidelines and prepares and maintains all subcontracts and amendments. Additionally, she is responsible for securing vessel insurance and verifies that all cooperators are maintaining worker's compensation coverage on their employees, if applicable.

The Administrative Assistant is responsible for receptionist/clerical duties, word processing, filing correspondence, dissemination of materials to industry (final reports, press releases, newsletter). She is also responsible for creating and organizing meeting files, processing invoices and maintaining cooperative program files.

Monitoring of Project Performance:

Given the current controversies and conflicts among various interest groups related to the programmatic concepts outlined here, there is a possibility that one (or more) of these groups will question the validity of the Foundation's findings. For internally conducted studies, Principal Investigators (PIs) will regularly communicate with observers and Foundation Coordinators concerning fieldwork. PIs also review data for completeness and accuracy, and the Program Director will monitor the data management procedure to ensure that all data analyses meet objectives outlined within the proposal. The quality of the data collected, and the procedures used to collect those data, will be assured through the use of highly qualified and knowledgeable observers who are experienced in this line of work.

Internal and external monitors will oversee the PIs' activities and responsibilities. The Foundation's Board of Trustees, representing various commercial fishing and seafood interests throughout the southeastern United States, oversee the PIs' tasks and are kept aware of and critically review interim and final project reports. This program will be conducted as an award from the NMFS and the timely completion of project objectives will be externally monitored by the Program Office of the NMFS Southeast Regional Office, NOAA Grants Management, and a NMFS Technical Monitor. Interim and final progress and financial reports concerning the program will be submitted to NOAA/NMFS, as required, to help the agency track the successful implementation, performance, and completion of the various tasks outlined in this proposal. During the period when analysis of the data is being conducted, the PIs and peer review consultants will discuss data, data analyses, and data interpretation. Only after the analyses have undergone rigorous evaluation will the final report be accepted and printed.

Information Dissemination:

Summary reports of the project's findings will be published as part of the "Foundation Project Update" section of the "Gulf and South Atlantic News," a publication of the Gulf & South Atlantic Fisheries Foundation, Inc. This newsletter is distributed to over 300 organizations and individuals throughout the region. An electronic version of this newsletter (PDF) is also included in the regular updates to the Foundation's website (www.gulfsouthfoundation.org). Mr. Helies will also provide summary results at a variety of advisory panel meetings and other venues while conducting Foundation business.

Copies of this project's final report will be published and distributed to various federal and state fishery agencies, university extension/Sea Grant offices, and industry associations. In addition, PDF copies of the final report will be made available for download from the Foundation's website.

Milestone Table:

Project Activities	2010				2011										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Project Start-up Activities / Contract Negotiations	xx	xx													
Project Coordination / Monitoring	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
Training of Observers	xx	xx	xx												
Selection of BRDs for Testing	xx	xx	xx												
Permit Applications & LOAs	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx			
Selection of Participating Vessels		xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx			
Experimental Tests		xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx			
Evaluation of Test Results							xx	xx	xx	xx	xx	xx			
Hydrodynamic Tests										xx	xx				
Progress Report Submission						xx						xx			
Financial Report Submission	xx						xx								xx
Project Closeout & Final Report Preparation													xx	xx	xx
Final Report Submission															xx

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