MARINE MAMMAL COMMISSION

5 February 2018

Louisiana Trustee Implementation Group
c/o U.S. Fish and Wildlife Service
P.O. Box 49567
Atlanta, Georgia 30345

Dear Trustee Implementation Group Members:

The Marine Mammal Commission (the Commission), in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the Louisiana Trustee Implementation Group's (LA TIG) Draft Strategic Restoration Plan and Environmental Assessment #3: Restoration of Wetlands, Coastal, and Nearshore Habitats in the Barataria Basin, Louisiana (draft SRP/EA; 82 Fed. Reg. 60377). The draft SRP/EA summarizes the LA TIG's evaluation of a suite of restoration techniques and approaches for restoring ecosystem-level injuries in the Barataria Basin and identifies a restoration strategy to help prioritize future decisions regarding project selection and funding.

The alternatives identified in the draft SRP/EA are designed to restore marshes in the Barataria Basin, an area that experienced some of the heaviest and most persistent oiling from the Deepwater Horizon (DWH) oil spill. The LA TIG has indicated that each of the alternatives identified in the draft SRP/EA meets the need "to restore the ecosystem-level injuries in the Barataria Basin and to restore, rehabilitate, replace, or acquire the equivalent of the injured wetlands, coastal, and nearshore habitat resources and services and compensate for interim losses of those resources from the DWH oil spill." However, the Commission is concerned that the identified restoration activities, particularly large-scale sediment diversions, may have significant adverse impacts on bottlenose dolphins that are resident to the Barataria Basin.

As noted in the Deepwater Horizon Trustees' Programmatic Damage Assessment and Restoration Plan/Programmatic Environmental Impact Statement (PDARP/PEIS) and reiterated in the draft SRP/EA, approximately 35 percent of the bottlenose dolphins in Barataria Bay died as a result of the oil spill, and 46 percent of female dolphins suffered from reproductive failure (DWH Natural Resource Damage Assessment (NRDA) Trustees 2016). Regulations implementing the Oil Pollution Act (OPA) require that Trustees, in the development of restoration alternatives, evaluate "the extent to which each alternative will prevent future injury as a result of the incident and avoid collateral injury as a result of implementing the alternative" (15 C.F.R. § 990.54). The Commission herein provides an analysis of the draft SRP/EA and recommendations with the intent of maximizing the long-term ecosystem benefits of the LA TIG's restoration efforts in the Barataria Basin while avoiding or minimizing collateral injury to resident bottlenose dolphins and their prey species.

Summary of restoration alternatives for the Barataria Basin

The LA TIG's draft SRP/EA constitutes Phase I of a process to evaluate a suite of restoration techniques and approaches for restoring injuries to the Barataria Basin caused by the DWH oil spill and associated response activities. In the development of its strategic alternatives, the LA TIG considered habitat restoration components of the State of Louisiana's 2017 Coastal Master Plan, as well as, projects submitted to the federal and state project portals in response to the LA TIG's March 2017 Notice of Solicitation that focused on projects to restore and conserve wetland, coastal, and nearshore habitats in the Barataria Basin[1]. The Barataria Basin was selected as the geographic scope for the draft SRP/EA because it experienced some of the heaviest and most persistent oiling and associated response activities during the DWH oil spill. The LA TIG evaluated a list of 37 projects against restoration criteria consistent with OPA and the Trustees' PDARP/PEIS (Table 4 of the draft SRP/EA) and chose 13 example projects that met the identified criteria. The alternatives for the draft SRP/EA were then developed based on a combination of restoration approaches and techniques exemplified by the projects chosen. Those alternatives include –

- Alternative 1: Marsh creation and ridge restoration plus large-scale sediment diversion (the preferred alternative);
- Alternative 2: Marsh creation and ridge restoration plus shoreline protection;
- Alternative 3: Marsh creation and ridge restoration; and
- Alternative 4: Natural recovery (the no action alternative).

The restoration approaches under each alternative are summarized in the draft SRP/EA. Briefly, **marsh creation** involves the placement of dredged materials to restore wetland habitat. Marsh creation projects are typically implemented in areas that historically supported marsh habitat, but the marsh has been lost to natural and human-induced processes. **Ridge restoration** projects re-establish historical ridge features within the marsh complex and are designed to complement marsh creation by protecting the marshes from further losses due to storm surge and wave action. **Large-scale sediment diversions** involve the transportation of large quantities of sediments via high-discharge volumes, in this instance from the Mississippi River, with the intent of restoring deltaic processes. **Shoreline protection** involves the construction of rock breakwaters to preserve shoreline integrity and reduce wetland degradation from wave erosion. **Natural recovery** would involve no direct human intervention intended to restore injured natural resources and services to baseline conditions.

Potential impacts of sediment diversion projects on Barataria Bay bottlenose dolphins and recommendations related to the MMPA and NEPA requirements

The LA TIG's preferred alternative would involve marsh creation, ridge restoration, and large-scale sediment diversions. That alternative was determined by the LA TIG to have the greatest potential for restoring, creating, and maintaining coastal wetland habitat in the Barataria Basin. However, as noted in section 3.2.1.2 of the draft SRP/EA, the LA TIG's preferred alternative also has the potential to result in unintended adverse impacts on Barataria Bay bottlenose dolphins and their prey species. Background on Barataria Bay dolphins, their habitat and prey species, and impacts

[1] http://la-dwh.com/2016_2017Restoration.aspx

from the Deepwater Horizon oil spill, are provided in the Appendix to this letter to provide context for the following discussion of potential impacts of the proposed sediment diversion projects.

As noted previously, large-scale sediment diversions proposed for the Barataria Basin involve the transportation of large quantities of sediment via high-discharge volumes from the Mississippi River. The diversions require the construction of gated structures that would be used to control freshwater and sediment flows from the river into the basin. They are designed to capture a high concentration of sediments and larger grain sizes from the lower portion of the water column. The sediments delivered during the river's annual flood cycle are intended to provide a stable structure for the development of new marshes and enhance the stability of existing marshes. In addition, large-scale sediment diversions are intended to restore deltaic processes that have been altered by the construction of levees to contain the river. Nutrients introduced into the basin as part of the river flow are expected to enhance primary productivity. The introduction of fresh water is intended to maintain the estuarine salinity gradients that are projected to be altered as a result of sea level rise and associated land loss. Although the LA TIG expects that re-establishment of deltaic processes that deliver sediment, freshwater, and nutrients will have a broader ecosystem-level benefit, the draft SRP/EA acknowledged that detailed modeling of the benefits associated with food web dynamics and nutrient cycling is lacking. Therefore, it is using the type and amount of marsh habitat created and sustained as the primary measure of benefit for each alternative.

Two example sediment diversion projects being considered by the LA TIG under the preferred alternative are the Mid-Barataria Sediment Diversion (MBSD) and the Ama Sediment Diversion (ASD). Combined, these projects are expected to build or maintain 4,300 acres of land in the near-term[2] (Year 20) and 106,300 acres of land in the long-term[3] (Year 50). The amount of land that will actually be built or maintained over the long term is difficult to model with certainty as it will depend on various factors (such as river flow, suspended sediment loads, subsidence and erosion rates, hurricanes and other extreme weather events, and sea level rise). That said, the Commission agrees that sediment diversions, combined with marsh creation and ridge restoration, appear to have the highest likelihood of restoring, creating, and maintaining coastal wetland habitat in the Barataria Basin, in accordance with the goals of the PDARP/PEIS.

However, of major concern to the Commission are the potential impacts on bottlenose dolphins from any sediment diversion project that would result in sudden, large and sustained influxes of fresh water into estuarine dolphin habitat. Such influxes could result in decreased health and foraging, thereby affecting dolphin reproduction and survival. The diversions, as proposed, could expose resident dolphins and their prey to extended periods (several weeks to months) of low-salinity (< 8ppt) water conditions (Das et al. 2012, de Mutsert et al. 2017, Wang et al. 2017). Areas of the bay most strongly affected by the diversions would be the middle section (Das et al. 2012), which contains preferred habitat for bottlenose dolphins (Hornsby et al. 2017).

Cetacean skin has a critical role in maintaining osmotic balance (Andersen and Nielsen 1983). Skin of bottlenose dolphin immersed in fresh water for up to a month demonstrated 'ballooning' degeneration of epidermal cells (Simpson and Gardner 1972). When salinity dropped below 1 percent (10 ppt), patchy necrosis and ulceration of the epidermis occurred (Manton 1986).

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[2] 8,000 acres of land built or maintained by the MBSD and 3,700 lost by the ASD.
[3] 29,7000 acres of land built or maintained by the MBSD and 76,600 by the ASD.

Skin sloughing has been observed in bottlenose dolphins within 24 hours of placement in fresh water (Greenwood et al. 1974), and salinity levels below 2 percent (20 ppt) are considered unsuitable for captive dolphins (Ridgway 1972). Dolphins in the GOM are subject to lower salinities after rainstorms but will not remain in waters that are below 1.5 percent (15 ppt) for any length of time (Manton 1986). Estuarine bottlenose dolphins known to have been exposed to low-salinity conditions or flooding events have been subject to disease outbreaks and/or higher rates of stranding and mortality (Colbert et al. 1999, Reif et al. 2006, Rosel and Watts 2008, Holyoake et al. 2010, Fury et al. 2012, Litz et al. 2014, Mullin et al. 2015). Compromised epidermal integrity and/or physiological stress resulting from exposure may make bottlenose dolphins more susceptible to secondary infections (Wilson et al. 1999, Holyoake et al. 2010). Analysis of blood serum from bottlenose dolphins exposed to freshwater 'out-of-habitat' conditions indicated changes in blood salt balance (Ewing et al. 2017). As noted in the draft SRP/EA, the health of Barataria Bay dolphins is already compromised by injuries resulting from the DWH oil spill, and the low salinity conditions would be expected to further increase their susceptibility to illness and death via alterations of skin integrity and salt balance.

Low-salinity conditions in mid-Barataria Bay also would affect the distribution of dolphin prey species, including spotted sea trout (de Mutsert et al. 2017). The LA TIG acknowledged potential effects on prey species in the draft SRP/EA but stated that prey species populations are expected to relocate to appropriate habitat. The LA TIG further speculated that total biomass would remain unchanged with a shift in species assemblages, as was observed after Caernarvon freshwater diversions into Breton Sound, just east of Barataria Bay (Chesney et al. 2000). However, there is considerable uncertainty as to whether dolphins can or will redistribute in response to changes in prey distribution, or shift their prey species to those expected to increase as a result of the diversions. Given that bottlenose dolphins did not leave their long-term community range in Sarasota Bay when harmful algal blooms (HABs) reduced prey availability dramatically, it has been suggested that at least some bottlenose dolphins inhabit "ecological cul-de-sacs" and should not be expected to move out of long-established ranges in response to environmental changes that affect prey (Wells 2010, 2014). Bottlenose dolphins in Barataria Bay exhibit year-round, multi-year site fidelity. Although dolphins appeared to move northward within the bay in 2010 to avoid response-related activities (McDonald et al. 2017), they did not vacate the bay even when oil coverage was extensive, consistent with the model from Sarasota Bay (Wells et al. 2017). In Florida Bay, dolphin habitat selection appeared to be influenced by environmental variables, such as salinity, chlorophyll *a*, and dissolved oxygen, as well as prey distribution[4] (Torres et al. 2008). Dolphins also tend to exhibit a high degree of philopatry to natal areas (McHugh et al. 2011a). Observations of juvenile dolphins exposed to HABs in Sarasota Bay demonstrated a temporary expansion of the area they used within the established community home range and other altered behaviors, most likely due to underlying changes in prey availability and distribution (McHugh et al. 2011b), which is consistent with a concurrent reduction in available prey species (Gannon et al. 2009). However, they did not leave HAB-affected areas. Similar studies of the behavioral response of dolphins to changes in prey availability, distribution, and species composition in response to salinity changes and other environmental disturbances are needed for Barataria Bay.

Another factor to consider in evaluating the impact of the proposed diversions on the Barataria Bay stock of bottlenose dolphins is the timing (both seasonal and duration) of freshwater

[4] As determined by Catch Per Unit Effort data.

influxes and its impact on dolphin reproductive success. Bottlenose dolphins give birth to a single calf that remains with its mother generally for the first three to six years of its life (Wells et al. 1987). Although calves can be born at any time during the year, calf sightings in the northern GOM are highest in spring and summer (Urian et al. 1996, Mattson et al. 2006, Miller et al. 2010, 2013). A study of Fiordland bottlenose dolphins exposed to freshwater discharge in New Zealand showed a higher prevalence of lesions in females and smaller-sized calves, suggesting that females and calves are particularly susceptible to health disorders in low-salinity conditions (Rowe et al. 2010).

In addition to low-salinity or freshwater conditions, other potential impacts of river diversions on bottlenose dolphins include disturbance from construction activities and associated vessel traffic. These can increase sound levels and disrupt foraging, habitat use, movement patterns, and other behavior (Nowacek et al. 2001, 2004). Increased vessel traffic also can increase the risk of vessel strikes (Wells et al. 2008, Bechdel et al. 2009). Understanding the cumulative effects of multiple stressors on Barataria Bay and other northern GOM estuarine bottlenose dolphins will require additional information on the individual effects of those stressors on dolphin physiology, behavior, and health, and more sophisticated modeling to determine the extent to which they may have aggregate or synergistic effects (National Academies of Sciences, Engineering, and Medicine (NAS) 2017a).

The potential for significant individual and cumulative impacts on the Barataria Bay stock of bottlenose dolphins warrants additional monitoring and analyses under both the Marine Mammal Protection Act (MMPA) and the National Environmental Policy Act (NEPA). Takes[5] of marine mammals are prohibited under the MMPA, with certain exceptions. Those exceptions include the incidental, but not intentional, taking of small numbers of marine mammals of a species or stock, but only if that taking will have a negligible impact on such species or stock (section 101(a)(5) of the MMPA). Applications for incidental take authorizations are required to include an estimate "by age, sex, and reproductive condition (if possible), the number of marine mammals (by species) that may be taken by each type of taking…and the number of times such takings by each type of taking are likely to occur." Applications also must include anticipated impacts on habitat, including impacts that will result in marine mammals avoiding or abandoning the area and/or impacts on prey species.

Despite some uncertainties regarding physiological and behavioral responses of bottlenose dolphins and their prey to low salinity and other environmental disturbances associated with large-scale diversion projects, the best available information suggests that such projects have the potential to injure marine mammals, which would constitute Level A harassment under the MMPA. The SRP/EA states that an interagency team currently is conducting studies of Barataria Bay dolphins to better understand baseline health, population dynamics, reproductive success, habitat use and movement, behavior, and key environmental parameters influencing their habitat. The Commission is aware of some studies conducted in 2017 but is not aware of any studies planned or funded for 2018 or beyond. Given the dynamic nature of the Barataria Basin and the various environmental factors that may influence dolphin movements, health, foraging, reproduction, and survival, the development and funding of a multi-year study plan in Barataria Bay is key.

[5] The term "take" under the MMPA means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.

The Commission recommends that the LA TIG continue to work with NMFS, the U.S. Army Corps of Engineers, and the State of Louisiana Coastal Protection and Restoration Authority (CPRA) to (1) ensure that multi-year studies are conducted in Barataria Bay that would provide adequate baseline information on bottlenose dolphins, their prey species and habitat and (2) develop a robust predictive model to estimate the number and types of takes of bottlenose dolphins that may occur incidental to diversion projects—such information would help determine whether an incidental take authorization can and should be issued under section 101(a)(5) of the MMPA. Continued studies of bottlenose dolphins in Barataria Bay are particularly important given recent efforts to accelerate the timeframe for proposed construction activities[6]. Further, the Commission recommends that the LA TIG, the U.S. Army Corps of Engineers, and CPRA ensure that project-specific analyses of the proposed restoration projects and associated activities are conducted to determine the potential project-specific and cumulative impacts of those activities on marine mammals and their prey, as required to be discussed in environmental impact statements under NEPA. The various analyses should be conducted under both NEPA and the MMPA before decisions are made regarding the development and implementation of large-scale diversion projects to better identify and incorporate effective measures to minimize adverse short- and long-term impacts on Barataria Bay bottlenose dolphins and their prey.

Monitoring and adaptive management

The Trustees recognized the importance of monitoring and adaptive management in supporting effective restoration by establishing it as one of the programmatic goals in the PDARP/PEIS. Toward that end, the LA TIG has proposed to use the System-wide Assessment and Monitoring Program (SWAMP) as the basis for its long-term, comprehensive monitoring and adaptive management program for the restoration of wetlands, coastal, and nearshore habitats in the Barataria Basin. SWAMP was designed to support Louisiana's coastal protection and restoration program by identifying specific data collection needs and leveraging other data collection activities on a wide range of variables (Hijuelos and Hemmerling 2016). However, neither SWAMP nor the Trustees' recently released Monitoring and Adaptive Monitoring Procedures and Guidelines Manual (Version 1.0; DWH NRDA Trustees 2017a) currently includes adequate requirements for monitoring the effects of large-scale habitat restoration projects on marine mammals or their prey.

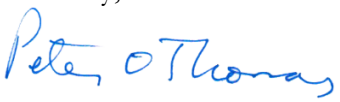
In 2016, NAS convened a panel to review restoration and science programs in the GOM. The purpose of the review was, in part, to identify the essential elements of a long-term monitoring framework "to improve the performance of restoration programs and increase the effectiveness and longevity of restoration projects" (NAS 2017b). With respect to marine mammals, the NAS recommended that "Gulf restoration programs should consider creating a specific enterprise for synthesis activities in support of Gulf restoration, because synthesis of monitoring data is required for evaluating restoration performance beyond individual projects and restoration program outcomes for wide-ranging species such as marine mammals, sea turtles, and birds." The panel identified best practices for monitoring marine mammal restoration as part of that review (see Part II–Marine Mammal Restoration Monitoring). The Commission has previously identified several existing marine mammal monitoring programs that the Trustees should consider expanding as part

[6] Louisiana Office of the Governor Press Release (26 January 2018) "CPRA Signs Landmark MOU with Trump Admin for 2-year federal permitting of Mid-Barataria Sediment Diversion Project" (http://gov.louisiana.gov/index.cfm/newsroom/detail/1247)

of their project-specific and broad-scale restoration monitoring efforts (see the Commission's 4 December 2015 letter). The Commission recommends that the LA TIG work with the Cross-TIG Monitoring and Adaptive Management work group to develop and implement a monitoring and adaptive management program for large-scale habitat restoration projects that incorporates best practices for marine mammals identified in the NAS 2017 report "Effective Monitoring to Evaluate Ecological Restoration in the Gulf of Mexico" and existing marine mammal monitoring programs as referenced in the Commission's 4 December 2015 letter to the DWH NRDA Trustees.

The Commission understands that the LA TIG will be developing further iterations of its restoration plan, associated NEPA documents, and monitoring and adaptive management program for restoration of wetlands, coastal, and nearshore habitats in the Barataria Basin and other parts of the GOM in subsequent months. The Commission would welcome the opportunity to contribute to those efforts.

Sincerely,



Peter O. Thomas, Ph.D.,
Executive Director

cc: Liz Williams, Louisiana Coastal Protection and Restoration Authority, Baton Rouge, LA
Michael Clancy, U.S. Army Corps of Engineers, New Orleans, LA

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Appendix: Background on Barataria Bay bottlenose dolphins

Abundance and distribution — The Barataria Bay stock of common bottlenose dolphins is one of 31 distinct bay, sound, and estuarine stocks of bottlenose dolphins recognized by the National Marine Fisheries Service (NMFS) in the Gulf of Mexico (GOM; Hayes et al. 2017, Rosel et al. 2017). Barataria Bay dolphins inhabit Caminada Bay, Barataria Bay, Bastian Bay, Bay Coquette, and Gulf coastal waters up to 1 km from shore year-round (Waring et al. 2016). Photo-identification surveys and habitat studies conducted during 2010-2014 to assess damages caused by the DWH oil spill provided an abundance estimate of 2,306 Barataria Bay dolphins (2,014–2,603, 95 percent CI; McDonald et al. 2017).

Preferred habitat — Miller (2003) observed dolphins year-round in Barataria and Caminada Bays in a wide range of environmental conditions, including waters of 10.9–33.9°C in temperature, 0.4–12.5 m in depth, and 3–800 m from shore with dissolved oxygen levels of 3.7–16.6 mg/L, turbidity levels of 1.4–34 Nephloid Turbidity Units (NTU), and salinity levels of 11.7–31.5 practical salinity units (psu). However, foraging was concentrated in waters with a narrower range of conditions. Foraging occurred more frequently in waters 20–24°C, 4–6 m in depth, and 200–500 m from shore with dissolved oxygen levels of 6–9 mg/L, turbidity levels of 20–28 NTU, and salinity levels of ~20 psu (Miller 2003, Miller and Baltz 2009). Dolphin habitat in Barataria Bay was further defined by Hornsby et al. (2017) using salinity thresholds determined by matching telemetry data with contemporaneous estimates of salinity. That study found that Barataria Bay dolphins most frequently used areas with salinities greater that 11 parts per thousand (ppt)[7], used areas with salinities less than 11 ppt but greater than 8 ppt for short periods of time, and avoided areas with salinities below 5 ppt. A salinity threshold of 8 ppt was used to estimate the total preferred habitat for dolphins in Barataria Bay as 1,167 km^2 (excluding land masses; see Figure 1 of Hornsby et al. 2017).

Residency patterns — Telemetry studies conducted in Barataria Bay after the DWH oil spill indicate that this stock exhibits multi-year site fidelity with small home ranges (mean < 70 km^2). Eighty-six percent of tag locations occurred inshore of the barrier islands, with the remaining 14 percent occurring within 4.24 km of shore (Wells et al. 2017). Dolphins also exhibited habitat-use patterns within three distinct areas: (1) the western part of Barataria Bay, (2) the barrier islands from Grand Terre westward, including Grand Isle and nearby Gulf waters, and (3) the barrier islands and coastal marshes east of Grand Terre (Figure 11 of Wells et al. 2017). Dolphins are known to inhabit the eastern part of Barataria Bay, but dolphins were not caught for tagging in this area because of the long distance from the field base (Randall S. Wells, pers. comm.). The long-term, year-round residency patterns of bottlenose dolphins observed in Barataria Bay are consistent with those of other bay, sound, and estuarine dolphin stocks in the northern GOM (Wells and Scott 1999, Vollmer and Rosel 2013, Hayes et al. 2017).

Foraging and prey species — Bottlenose dolphins prey on a wide variety of fishes, but they exhibit prey preferences, selecting soniferous fish disproportionately relative to their availability (Barros and Wells 1998, Gannon et al. 2005, Berens McCabe et al. 2010). Analyses of prey species from both stranded and free-ranging dolphins in Sarasota Bay revealed a preference[8] for pinfish

[7] Salinity units of psu and ppt are nearly equivalent.
[8] The species listed occurred at a frequency of 10 percent or more in samples analyzed by Dunshea et al. (2013).

(*Lagodon rhomboides*), toadfish (*Opsanus* spp.), spot (*Leiostomus xanthurus*), hogfish (*Elops* sp.), pigfish (*Orthopristis chrysoptera*), mullet (*Mugil* sp.), spotted seatrout (*Cynoscion* sp.), sheepshead (*Archosargus probatocephalus*), and pufferfish (*Sphoeroides* sp.) (Berens McCabe et al 2010, Dunshea et al. 2013). Similar prey data are not currently available for the Barataria Bay dolphin stock but are likely similar.

DWH oil spill-related injuries — NRDA-related studies conducted during and after the DWH oil spill documented numerous health problems in stranded and live-captured dolphins in Barataria Bay. Those included persistent reproductive failure, adrenal disease, lung disease, and poor body condition (Schwacke et al. 2013, Lane et al. 2015, Venn Watson et al. 2015, Colegrove et al. 2016, Kellar et al. 2017, Smith et al. 2017). Compared to other southeast U.S. dolphin populations, it was estimated that in the three years following the oil spill (2011–2014) the Barataria Bay stock experienced a 35 percent higher mortality rate (15–49, 95 percent CI), an excess of 46 percent failed pregnancies (21–65, 95 percent CI) and a 37 percent higher likelihood of adverse health effects (14–57, 95 percent CI; DWH NRDA Trustees 2016). That level of injury represents a 51 percent reduction in population size (32–72, 95 percent CI). In the absence of active restoration, it was estimated that the population would take 39 years (24–80, 95 percent CI) to recover.

Restoration of the Barataria Bay stock of dolphins will be largely the responsibility of the LA TIG. The TIGs have yet to prepare a restoration plan for Barataria Bay bottlenose dolphins or any other marine mammal stock injured by the DWH oil spill. However, a Strategic Framework for Marine Mammal Restoration Activities is now available to guide the development of marine mammal restoration plans (DWH NRDA Trustees 2017b).

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