RESTORE Act Bucket 2 Round 1 November 2014

Council Member Proposal – State of Texas

Salt Bayou Freshwater Inflows Restoration: Feasibility Study, Design, Engineering And Permitting

(1) SUMMARY SHEET (Appendix A)

Appendix A: Council Member Applicant and Proposal Information Summary Sheet

Council Member: Commissioner Toby Baker Texas Commission on Environmental Quality MC 100 P.O Box 13087 Austin, TX 78711-3087	Point of Contact: Jane Sarosdy, Texas General Land Office Phone: (512) 475-3786 Email: jane.sarosdy@glo.texas.gov

Project Identification

Project Title: Texas Salt Bayou Freshwater Inflows Restoration: Feasibility Study, Design, Engineering & Permitting	Project
State(s): Texas	County/City/Region: Jefferson County

General Location: *Projects must be located within the Gulf Coast Region as defined in RESTORE Act. (attach map or photos, if applicable)*
Professional services for engineering and design, wherever they occur, will substantially benefit projects within the Gulf Coast Region. See maps.

Project Description

RESTORE Goals: *Identify all RESTORE Act goals this project supports. Place a **P** for Primary Goal, and **S** for secondary goals.*

- [P] Restore and Conserve Habitat
- [S] Restore Water Quality
- [ ] Restore and Revitalize the Gulf Economy
- [S] Replenish and Protect Living Coastal and Marine Resources
- [ ] Enhance Community Resilience

RESTORE Objectives: *Identify all RESTORE Act objectives this project supports. Place a **P** for Primary Objective, and **S** for secondary objectives.*

- [P] Restore, Enhance, and Protect Habitats
- [S] Restore, Improve, and Protect Water Resources
- [S] Protect and Restore Living Coastal and Marine Resources
- [S] Restore and Enhance Natural Processes and Shorelines
- [S] Promote Community Resilience
- [S] Promote Natural Resource Stewardship and Environmental Education
- [S] Improve Science-Based Decision-Making Processes

RESTORE Priorities: *Identify all RESTORE Act priorities that this project supports.*

- [☑] Priority 1: Projects that are projected to make the greatest contribution
- [☑] Priority 2: Large-scale projects and programs that are projected to substantially contribute to restoring
- [☑] Priority 3: Projects contained in existing Gulf Coast State comprehensive plans for the restoration ….
- [☑] Priority 4: Projects that restore long-term resiliency of the natural resources, ecosystems, fisheries …

RESTORE Commitments: *Identify all RESTORE Comprehensive Plan commitments that this project supports.*

- [☑] Commitment to Science-based Decision Making
- [☑] Commitment to Regional Ecosystem-based Approach to Restoration
- [☑] Commitment to Engagement, Inclusion, and Transparency
- [☑] Commitment to Leverage Resources and Partnerships
- [☑] Commitment to Delivering Results and Measuring Impacts

RESTORE Proposal Type and Phases: *Please identify which type and phase best suits this proposal.*

[☑] Project [☑] Planning [ ] Technical Assistance [ ] Implementation [ ] Program

Project Cost and Duration

Project Cost Estimate: **Total** : $1,500,000	$ $1,500,000	**Project Timing Estimate**: Date Anticipated to Start: 6 / 15 Time to Completion: 18-36 months / ~~years~~ Anticipated Project Lifespan: 5 years

(2) EXECUTIVE SUMMARY

The Salt Bayou ecosystem in Jefferson County, Texas is the largest contiguous estuarine marsh complex in Texas. The 60,000 acre marsh system historically contained a continuum of freshwater and intermediate marshes that transitioned into brackish marshes in the lower areas near the confluence of Taylor Bayou and Sabine Lake. The creation of numerous channels in this area for navigation, especially the Gulf Intracoastal Waterway (GIWW), has completely cut off the freshwater inflows from the northern to the southern portions of the marsh. The GIWW bisects the Salt Bayou marsh, in effect creating a freshwater non-tidal marsh north of the GIWW and a brackish to saline tidal marsh to the south. Other factors have contributed to the increased salinity in the southern marshes, including subsidence, erosion, and frequent overwash from Gulf storms. Two hurricanes – Rita in 2005 and Ike in 2008---scoured the Salt Bayou marsh, causing devastating impacts to the marsh ecosystem.

Texas natural resource agencies and local stakeholders have reached consensus on a number of measures to re-establish the salinity gradient in the marshes south of the GIWW, including reconnecting the flow of freshwater from the northern marshes. The comprehensive Salt Bayou Watershed Restoration Plan was developed buy these agencies and stakeholders to promote the implementation of a comprehensive approach to restoring the marsh (TPWD 2013). One of the goals of the Salt Bayou Plan is to restore freshwater inflows to the southern portion of the Salt Bayou Watershed.

This project, the Texas Salt Bayou Freshwater Inflows Restoration: Feasibility Study, Design, Engineering & Permitting, will provide the funding needed to design the use of passive inverted siphons to reconnect freshwater inflow from the northern to the southern portions of the marsh to lower the salinity south of the GIWW. The concept of using siphons in Salt Bayou has been discussed for years. In 2009, a study was published by the Texas Water Development Board that provided results of salinity and hydrodynamic models that assessed the value of siphons in the area (Pothena and Guthrie 2009). The study concluded that siphons would contribute to lower salinities south of the GIWW, but that a feasibility study must be done to explore the technical aspects of siphons. This project would provide funding to complete this needed feasibility study. If the feasibility study finds that siphons can be constructed to provide benefits needed in this area, additional funds from this grant would be used for engineering, design and permitting.

This project addresses goals, objectives, priority criteria, and commitments identified in the RESTORE Act and in the Initial Comprehensive Plan of the RESTORE Council. The primary goal addressed by this project is to create a shovel-ready freshwater siphon project to restore freshwater inflows and thus restore and conserve habitats in the Salt Bayou System. Upon ultimate construction and the successful lowering salinity in the lower portion of Salt Bayou marsh, the project will make a significant contribution to restoring the natural resources, ecosystems, wildlife habitats, and coastal wetlands of the Gulf Coast region. Adding adequate fresh water to the system will create a salinity regime that would promote plant growth and soil stability. The project is ideally suited for the selected focal project areas of habitat and water quality for this round of Comprehensive Plan funding.

Texas has a long history of successful coastal restoration projects. Collaborative working relationships exist between state and federal natural resource agencies, local governments and the nongovernmental organization (NGO) community. Attached are letters of recommendation from Jefferson County Judge Branick, the Texas General Land Office, and Ducks Unlimited.

The funding of this project to generate shovel-ready freshwater siphon project will greatly enhance the ongoing shared goal of a thriving and resilient Gulf coastal shoreline.

Implementation information

The feasibility study for this project will be comprehensive and will likely take 12-18 months to complete. If the siphons are found to be feasible, preliminary work, design and engineering by an experienced coastal engineering firm should take 6-8 months. When engineering and design is complete, the project manager will pursue required permitting, which can take an additional 3-12 months, depending on the type of permitting required. It is anticipated that feasibility, engineering, design and permitting for the project should be completed by 18-36 months from the date that the funding becomes available.

Monitoring and measures of success of the project

The project proponent will work with representatives from federal and state agencies, local community representatives, nongovernmental organizations, and other interest groups during the planning phases. Meetings will be held between project proponents and the surveyors and engineers throughout the project period, as needed, to review progress and materials. Project proponents will work closely with the engineering firm(s) to oversee due diligence investigations at the project sites, including, but not limited to, surveys (bathymetric, etc.), analyses (geotechnical, etc.), and consultations (environmental, etc.). The project engineer(s) will use data from due diligence investigations to compile alternatives and cost analyses, which will be reviewed by the project proponents. The proponent will select a design alternative that best fits the project goal, objectives, and budget, and the engineers will produce final design drawings. The project proponent and the engineers will work together to prepare, submit, and coordinate permit applications based upon the final designs. Monitoring and adaptive management plans for the siphons to be created will be developed during this planning phase of the project.

Uncertainties and risks associated with the project

The risks and uncertainties of the siphon construction phase include potential opposition by adjacent landowners and other stakeholders, maintenance costs due to sedimentation, coordination with USACE navigation operations of the GIWW, and unintended changes to upstream or downstream habitat functions/values. Project design uncertainties are closely akin to project construction uncertainties. Planners must account for the risk of unknown future events that may affect the feasibility and efficacy of the siphon construction itself. Tropical weather events can also adversely affect the completion of a coastal construction project. The planner for the project will need to take these uncertainties into account in preparing the required plans and obtaining the necessary permits.

(2) PROJECT NARRATIVE

1. Proposal introduction & background.

The Texas Salt Bayou Freshwater Inflows Restoration: Feasibility Study, Design, Engineering and Permitting Project will provide funding for planning, which includes a comprehensive feasibility study, and, if the study finds the siphons to be workable, for necessary surveys, engineering, design, permitting, and budget development for construction of two freshwater siphons. The goal is to move the project to a shovel-ready state. Working with coastal professionals, the proponent will design a project that will install siphons that will successfully

lower the salinity in marsh areas in the lower portion of the Salt Bayou Watershed, which will restore estuarine habitat and improve water quality for wildlife and plants.

The siphons will be located at points along the Gulf Intracoastal Waterway (GIWW) with intake structures on the upper portion and outflow structures on the lower portion of the marsh. The exact location of the points will be determined in the feasibility study, which will select optimum crossing spots for construction and restoration. The construction of Salt Bayou siphons for wetland restoration has been contemplated by federal and Texas natural resource agencies for years. Implementation of the siphons has been hampered by the lack of funding for a comprehensive feasibility study and project design. Making the siphon project shovel ready will greatly improve the chances of funding construction.

Background of Degradation of the Salt Bayou Watershed

The Salt Bayou Watershed is located west of Sabine Lake in Jefferson County on the upper Texas coast. It contains the largest contiguous estuarine marsh complex in Texas, covering approximately 60,000 acres in the Texas Chenier Plain, the westernmost geologic delta of the Mississippi River, extending from Vermillion Bay, Louisiana, to Galveston Bay, Texas. The Salt Bayou ecosystem includes freshwater to estuarine marsh, coastal prairie grasslands, tidal flats, creeks and basins and associated aquatic vegetation. It is widely recognized for its fishing, hunting, and wildlife viewing opportunities, fisheries productivity and wintering and migratory bird habitat (TPWD 2013).

The Salt Bayou Watershed has suffered from a number of man-made structures and activities such as channel dredging have exacerbated the increased salinities in the lower Salt Bayou Watershed. Railroad infrastructure and oil exploration in the marsh has adversely altered hydrology, as have the impoundment of upstream rivers and the creation of dredged material placement areas in the marsh (TPWD 2013).

The primary factor in the degradation of the Salt Bayou Watershed was the construction of the GIWW. This Sabine Lake-to-Galveston Bay stretch of the GIWW was completed by 1933 and today transports the highest value commodities and products in the 426 miles of the waterway in Texas as well as the entire 1,300-mile GIWW extending from Brownsville, Texas at the border with Mexico to St. Marks in Florida. (Leatherwood 2010) At the time of the GIWW's construction of the Sabine Lake-to-High Island stretch that bisected Salt Bayou Watershed, the U.S. Army Corps of Engineers recommended the placement of siphons in this stretch of the GIWW to restore the natural freshwater flow to coastal marshes located between the GIWW and the beach dune system along the Gulf coast (Alperin 1977). No siphons have yet been built ato restore the hydrodynamics of the pre-GIWW marsh.

Historically, fresh water from the upper portions of the Salt Bayou system drained to the northeast through Salt Bayou into Taylor Bayou and then Sabine Lake before the GIWW was dredged. The dredging truncated the water flow, diverting it into a water control structure that drained into the GIWW. Under pre-GIWW conditions, Star Lake, which is located at the western edge of the Salt Bayou Watershed, would supply a volume of freshwater sufficient to maintain the historic west-to-east pattern of flow which could displace and dilute salinities lower in the system in places such as Keith Lake. Presently, the truncated watershed is unable to supply sufficient freshwater inflows. Moreover, an additional source of saline water from overtopping along the beach ridge increases salinity levels in the water that flows from Star Lake, further

limiting the ability of the system to push back against the saline waters entering through the Keith Lake Fish Pass at the eastern edge of the watershed (Pothina and Guthrie 2009).

In 1996, the U.S. Army Corps of Engineers (USACE) filled Little Keith Lake, shutting off additional flow. This action made the confluence of the GIWW and Salt Bayou the only access point for estuarine organisms and tidal waters. This resulted in a decline of the estuarine function of the wetlands along with a decline in recreational and commercial fishing (TPWD et al. 1976).

In addition to impediments caused directly by human activities, the Salt Bayou Watershed area is suffering from substantial shoreline erosion and retreat, resulting in land loss comparable to that of coastal Louisiana. On average, the shoreline in Jefferson County has been retreating 9.2 ft/year and land loss rates have averaged 35.7 acres/year (Paine et al. 2012). In 2008, Hurricane Ike, which made landfall approximately 65 miles to the southwest, resulted in land loss of 14.8 km^2 (5.7 mi^2) (Barras et al. 2010). Ike also scoured vegetation from the Salt Bayou complex and decimated the beach ridge located in the Texas Point and McFaddin NWR that had provided vital protection from salt water intrusion (USFWS 2008). These events and processes have lowered the resiliency of the Salt Bayou Watershed, making it more vulnerable to assaults such as extreme weather and frequent overwash from the Gulf of Mexico. A year-long drought of record in 2011 resulted in a lack of freshwater inflows and rainfall that exacerbated salinity levels throughout the area. These conditions have resulted in plant death and loss of organic soils to resulting in the transition of marsh to shallow open salt water.

Ecological Damage Caused By Cutting Off Fresh Water to the Marsh South of the GIWW

The overall degradation of water quality within the marsh complex has slowly and episodically altered estuarine conditions, adversely affecting diverse wetland habitats (TPWD 2013). Organic soils have dissolved and eroded and salt intolerant plant communities have died, resulting in increasing expanses of shallow open water. Production of brown and white shrimp and blue crabs has been shown to decrease as open water area exceeds 75-80 % relative to vegetated marsh (Minello and Rozas 2002).

Wetlands north of the GIWW are dominated by plants tolerant of freshwater, including *Spartina patens, Typha spp., Scirpus californicus, Eleocharis spp.,* and *Echinochloa spp.* These plants are adapted to fresh water conditions and a cycle of inundation and drying that promotes germination of seeds and vegetative growth. Current conditions do not allow this pattern of draining and periodic drying within these marshes, causing the plants to form a floating marsh in which the plants are rooted to a floating bed of organic debris, not mineral or organic soils. Floating marshes are highly susceptible to damage or loss from storm surge. Restoring the flow of fresh water from this area to Salt Bayou will allow the historic, and biologically critical, pattern of inundation and drying to return, giving plants in these marshes the opportunity to become rooted firmly in the soil. This cycle will also promote production of submerged aquatic vegetation and seeds from annual wetland plants which are a major component of diets of waterfowl and other birds wintering along the coast.

Marshes south of the GIWW have been degrading since the GIWW was completed. The rate of conversion from marsh to open water averages around 0.69% per year but this has varied through time. Losses are more severe in the eastern portions of the watershed, with reduced losses and at time accretion of marsh observed from the mouth of 10-mile cut westward through McFaddin NWR (German, 2002, 2013). Marsh loss in this system is caused by the processes observed in

Louisiana; salt water and constant waterlogging physiologically stressing the vegetation until it is extremely weakened or dies, then the soils being eroded out from around the roots.

Hunting and fishing opportunities remain plentiful today but the quality of opportunities is likely to decrease as the habitat continues to degrade. Increased salinities have accelerated wetland plant loss while enhancing access of some estuarine marine fisheries including gulf menhaden, blue crabs, brown shrimp, and spotted seatrout, all valuable fisheries species. This accelerated increase in fisheries production will reverse as marsh loss continues, undercutting the foundation of the food web and its associated nursery habitat function (Boesch, et al., 1994; Minello and Rozas 2002). Plant viability, longevity, and reproductive success will decrease because seawater in flooded wetland soils leads to the conversion of sulfate to hydrogen sulfide, a compound toxic to marsh plants. Some plant species may be replaced by more tolerant species. However, conversion of marsh to open water has been the dominant outcome of this process as surface soils are lost and the area is inundated to a depth incompatible with establishment and growth of plants. Substantial marsh loss has already occurred in this system (German and O'Brien 2002). This process of increased salinity and increased frequency of salinity spikes will continue to lead to a degraded ecosystem with reduced fisheries productivity, reduced use by migratory birds and mammals, elimination of most reptile and amphibian species, and reduction in abundance of the macroinvertebrate community (USFWS 2010; Haas et al. 2004).

Restoring Freshwater Inflows to the Marsh Complex South of the GIWW

The Salt Bayou ecosystem has changed dramatically in response to increased salinity, increased frequency of salt water intrusion events, and continued marsh loss.

> Areas of open water are increasing at the expense of other nearby habitat types. Plant communities have shifted so that only the more salt tolerant species remain, and/or additional areas of open water were created in areas where plants died due to harsh environmental conditions. Additionally, many of the historic reptiles and amphibians that were present have decreased or disappeared. Muskrats, nutria, and river otters, once common, have declined dramatically . . . . Sightings of these mammals within the Salt Bayou system are now rare. The number of waterfowl using the system declining. The change in numbers reflects a shift in where waterfowl are spending the winter months, with more of them spending increasingly more time further inland in more preferable freshwater habitats . . . . Hunting opportunities remain plentiful today but the quality of opportunities is likely to decrease as the habitat continues to degrade. (TPWD 2013 at 25)

There is a great need for a project to restore the hydrological and hydrodynamic connection between the two large areas within the Salt Bayou Watershed that were severed by construction of the GIWW. To address this severed hydrologic connection, resource managers have proposed a project to install two inverted siphons (each consisting of one or more submerged culverts), which will restore this connection with adequate inflows to restore marsh habitat. This restoration is expected to increase habitat diversity, increase and enhance utilization of the area by fish and wildlife, and reduce the loss of emergent marsh habitat in the Salt Bayou marsh south of the GIWW.

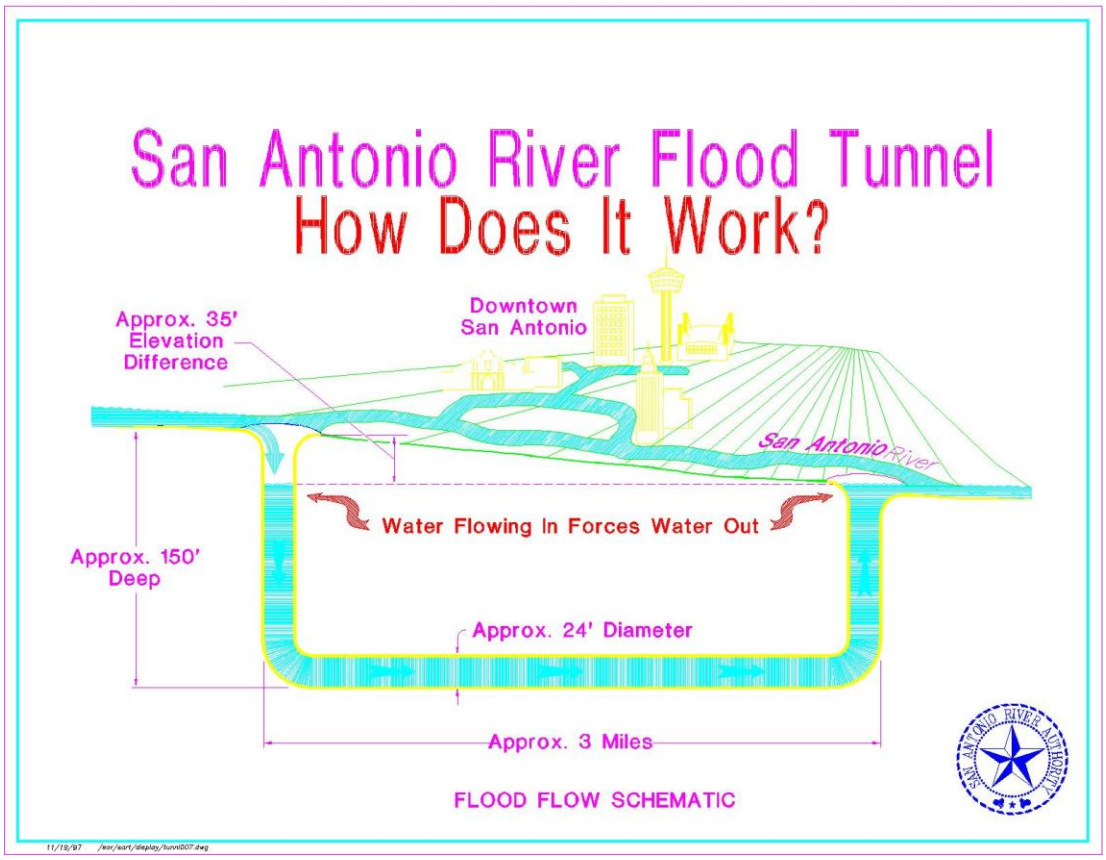
The comprehensive feasibility study would evaluate the workability of inverted siphon technology in light of the episodic nature of the flows from north of the GIWW to the south. In addition, the study will whether the construction of siphons is possible, taking into account factors such as intake and outtake design, prevention of sediment deposition, and maintenance

procedures. The feasibility study will be comprehensive and will likely take 12-18 months to complete. If the siphons are found to be feasible, preliminary work, design and engineering by an experienced coastal engineering firm should take 6-8 months. During the development of project design features, the project manager and coastal engineers will coordinate with the state and federal natural resource agencies to ensure that all design features comply with statutory obligations. When engineering and design is complete, the project manager will pursue required permitting, which can take an additional 3-12 months, depending on the type of permitting required. It is anticipated that feasibility, engineering, design and permitting for the project should be completed in 18-36 months from the date that the funding becomes available.

2. Implementation technology

This project will provide funding for a feasibility study, engineering, design, and permitting. The project proponent will engage the services coastal engineers to conduct hydrodynamic assessments and analyses, design restoration plans and complete construction drawings, prepare lease and permit applications to USACE and state resource agencies as required.

An inverted siphon is a commonly used passive water conveyance structure. It would consist of an inlet structure on the north side of the GIWW, an outlet structure on the south side of the GIWW, and one or more submerged culverts beneath the GIWW to connect the inlet and outlet. Flow through the siphon occurs whenever the water level at the inlet exceeds the water level at the outlet, as is the case during rainfall runoff events in the upper Salt Bayou watershed. The outlet will be configured to prevent backflow from south to north. An example of a much larger inverted siphon that makes the San Antonio Riverwalk possible is shown here:



Note that unlike some similar projects (e.g., Louisiana coastal restoration projects), the goal of the proposed project is to convey water, not sediment. Sediment transport across the GIWW is not a project objective; therefore, design and adaptive management measures can be used to keep the facility clear of sediment and minimize maintenance needs.

3. Monitoring and adaptive management (if applicable)

The project proponent will work with representatives from federal and state agencies, local community representatives, nongovernmental organizations, and other interest groups during the planning phases. Meetings will be held between project proponents and the surveyors and engineers throughout the project period, as needed, to review progress and materials. Project proponents will work closely with the engineering firm(s) to oversee due diligence investigations at the project sites, including, but not limited to, surveys (bathymetric, etc.), analyses (geotechnical, etc.), and consultations (environmental, etc.). The project engineer(s) will use data from due diligence investigations to compile alternatives and cost analyses, which will be reviewed by the project proponents. The proponent will select a design alternative that best fits the project goal, objectives, and budget, and the engineers will produce final design drawings. The project proponent and the engineers will work together to prepare, submit, and coordinate permit applications based upon the final designs. Monitoring and adaptive management plans for the siphons to be created will be developed during this planning phase of the project.

4. Measures of success for the proposed project or program

Specific measures of success for this project will include completion of a comprehensive feasibility study, an approved project design, and submission of all required permit applications to the respective agencies. In other words, pending receipt of all necessary permits, the project should be made shovel ready by the end of the project period.

Success of the siphon construction project can be measured directly in several ways using the existing data collection network augmented with new project-related data collection. Measures of success might include the following: (1) Changes in salinity at locations within the watershed south of the GIWW and accompanying improvements in habitat functions and values can be measured and compared to baseline (pre-project) conditions; (2) Changes in marsh loss rates within the entire watershed can be measured and compared to rates documented in previous studies; (3) Restoration of the general west-to-east pattern of freshwater flow can be measured directly and indirectly; and (4) Reductions in post-event water levels in the upper watershed can be documented as indicators of reduced negative impacts of drowning of habitats in the upper watershed. Associated improvements in habitat type and quality can be compared to baseline conditions.

5. Risks and uncertainties of the proposed activities

The risks and uncertainties of the siphon construction phase include potential opposition by adjacent landowners and other stakeholders, maintenance costs due to sedimentation, coordination with USACE navigation operations of the GIWW, and unintended changes to upstream or downstream habitat functions/values. Project design uncertainties are closely akin to project construction uncertainties. Planners must account for the risk of unknown future events that may affect the feasibility and efficacy of the siphon construction itself. Tropical weather events can also adversely affect the completion of a coastal construction project. The planner for

the project will need to take these uncertainties into account in preparing the required plans and obtaining the necessary permits.

Overall, the greatest risk of harm to the Salt Bayou Watershed is to do nothing to restore natural watershed connectivity. If implemented successfully, the proposed project will result in hydrologic and hydraulic conditions more similar to conditions that existed prior to anthropogenic influences. If the project is unsuccessful, resulting conditions will be similar to the no-project condition which will result in continued degradation of the watershed.

6. Outreach & education opportunities

The Texas natural resource agencies TPWD, TCEQ and the GLO will publicize and feature the funding of the Salt Bayou Siphon project design phase on www.restorethetexascoast.org. It will be hailed as a significant first step in implementing the RESTORE Act in Texas, and thus the agencies will make extra efforts to inform the public about the project and the environmental benefits that will flow from them.

Public Access

McFaddin NWR, Sea Rim State Park, and J.D. Murphree WMA collectively offer a variety of recreational opportunities to visitors. These include hunting, fishing, wildlife observation, photography, environmental education and interpretation. McFaddin NWR typically sees over 80,000 visitors a year, including an annual event, Marsh Madness, which accommodates over 250 visitors, and an annual field trip made by Hamshire-Fannett Elementary school, typically about 250 elementary school students. McFaddin NWR typically has about 4,500 individual hunter-visits per year. Fishing is also offered on McFaddin NWR, including surf fishing and fishing in other designated areas and fishing piers. Fishing typically accounts for about 27,750 of the 80,000 visits to McFaddin.

McFaddin has about 15 miles of paved roadways for visitors to use when enjoying wildlife observation, along with an observation deck. There are approximately 100 wildlife observation visits during a single year. McFaddin NWR is also used as a destination for beach access and kayak participation. McFaddin NWR visitors contribute to local and regional economies through tourism-related purchases and expenditures, and nature tourism is an important and growing industry in the region and in Texas as a whole.

Hunting

Waterfowl hunting has been a tradition along the upper Texas coast for generations. Prior to the establishment of McFaddin NWR, the area was hunted through private ownership or lease. Currently, waterfowl hunting is offered on McFaddin NWR, ranging from free, first-come, first-serve programs to a more formal fee permit reservation system. Different hunt units are open on different days of the week to provide hunting opportunities throughout the week, as well as periods of rest for waterfowl. Approximately 40% of the Refuge is typically open for waterfowl hunting, the maximum allowable on lands acquired under authority of the Migratory Bird Conservation Act, (16 U.S.C. 715d.).

Hunting is offered on the J. D. Murphree WMA on a first come, first served system. The J. D. Murphree WMA typically receives 3,000 hunter-visits during the early teal and regular waterfowl seasons each year. Hunting on the WMA alternates between the Salt Bayou Unit south of the GIWW and the Big Hill Unit with no hunting occurring on Mondays.

Fishing

Saltwater fishing opportunities are available on McFaddin NWR. Saltwater fishing opportunities are found along 19 miles of beach along the Gulf of Mexico, in 10 Mile Cut and 5 Mile Cut of Salt Bayou, in Star Lake, Clam Lake, Willow Lake, Barnett Lake, and on the GIWW. This is the largest user group of McFaddin NWR. The Salt Bayou Unit of J. D. Murphree WMA is open year round to fishing, including non-commercial crabbing, within Keith, Johnson, and Shell lakes. Fishing is permitted within the marsh areas from March to the end of August, but closed during the waterfowl hunting seasons. Most fishing is by boat, but some bank fishing occurs along the banks of the Keith Lake Fish Pass. TPWD does not require any form of registration for fishing activities; therefore no estimates of use by fishing-visits are available.

Wildlife Observation and Photography

Wildlife inhabiting the coastal marshes, prairies and woodlands on McFaddin NWR are abundant and diverse. Dozens of migratory bird species utilize habitat on the refuges to feed, rest, and nest. Over 27 species of waterfowl can be found throughout the winter months, and flocks of snow geese in excess of 100,000 can sometimes be seen. Spring and fall are prime time for migrating shorebirds and songbirds. Migrating shorebirds primarily utilize beach areas and mudflats on McFaddin NWR. Small and colorful neotropical songbirds can be found in the small woodlands or riparian corridors located primarily on Highway 87 of McFaddin NWR. Of special interest to the birding community are the secretive rails that occupy refuge marshes. All six species of North American rails can be found on the Refuge Complex at some time during the year. In addition, resident waterbirds are visible in wetland habitats throughout the year.

Environmental Education and Interpretation

McFaddin NWR staff provides interpretive tours and programs to interested schools and organizations upon request. Special events are held on the Refuge throughout the year to promote awareness and understanding of the important natural resources found along the upper Texas coast.

7. Leveraging of resources and partnerships

No additional funding is anticipated for these projects for engineering and design beyond that requested with this proposal. However, the process of engineering and design will rely upon participation by a host of project partners in the Salt Bayou Workgroup. The participating agencies of the Salt Bayou Workgroup each recognize the value of the proposed project to the successful implementation of the Salt Bayou Plan. Collectively, these agencies have provided extensive resources including personnel, expertise, data, and funding to develop and now implement the SBP. This group includes the major landowners, political entities representing the public (e.g., Jefferson County), and natural resource agencies at the state and federal level.

Salt Bayou Workgroup Members:
Ducks Unlimited
Jefferson County, Texas:
- Engineering Department
- Jefferson County Drainage District No. 6

National Oceanic and Atmospheric Administration (NOAA),
National Marine Fisheries Service:
- Habitat Conservation Division

Restoration Center
Texas General Land Office:
Coastal Erosion Planning and Response Act (CEPRA) Program
Natural Resource Damage Assessment Program
Texas Parks and Wildlife Department (TPWD):
Wildlife Division
Coastal Fisheries Division
Environmental Assessment, Response, and Restoration Program
Texas Water Development Board:
Coastal Water Resources Group
U.S. Army Corps of Engineers (Galveston District)
U.S. Fish and Wildlife Service (USFWS):
McFaddin National Wildlife Refuge
Coastal Program

8. Proposal project / program benefits

The resource improvements and benefits of the project would generally occur within the Salt Bayou Unit of the J.D. Murphree WMA and the McFaddin NWR. Thus, the project would improve habitat in a large area of protected, heterogeneous habitat managed by federal and state land managers and is mostly open to public use. The construction of the siphon system could influence and improve salinity conditions and result in a corresponding increase or enhancement of marsh ecological functions over a sizable area within the lower Salt Bayou Watershed.

The restoration of freshwater inflows from Federal, state, and privately owned wetlands north of the GIWW to the coastal southern portion of the Salt Bayou Watershed lays the foundation for the restoration of thousands of acres of estuarine emergent marsh through improving the water quality in the lower Salt Bayou marsh complex. Restoration of estuarine habitats is especially important not only to maintain essential habitat for commercially and recreationally important marine species, but also for their prey species, as so many of the prey species are also estuarine dependent. The marsh edge, in particular, serves as a critical transition between the emergent marsh vegetation and open water by providing a gateway for the movement of organisms and nutrients between intertidal and subtidal estuarine environments.

The habitats restored through this project are important to the life cycles, and therefore the sustainability, of many ecologically and economically significant marine species. The contributions of such natural resources on the ecology and economy of Texas are, in a major way, dependent upon the Salt Bayou Watershed having habitat suitable to their development.

The Salt Bayou Plan is particularly suitable for investment by the RESTORE Council because the success of the Plan fully meets all five of the adopted goals of the Council. The multiple values important to the RESTORE Council are highlighted in the Salt Bayou Watershed. The habitats restored through restoring inflows of fresh water to the Salt Bayou watershed are important to the life cycles, and therefore the sustainability, of many ecologically and economically significant species of fish and wildlife (TPWD 2013) The contributions of such natural resources on the ecology and economy of Texas are, in a major way, dependent upon the Sabine-Neches Watershed, the Salt Bayou Watershed, and Galveston Bay having habitats suitable to their development. Restoration of coastal wetlands is especially important not only to maintain their essential habitat for commercially and recreationally important species of fish and

wildlife, but also for their wetland-dependent prey species. (Minello and Rozas 2002) The marsh edge, in particular, serves as a critical transition between the emergent marsh vegetation and open water by providing a gateway for the movement of organisms and nutrients between aquatic and wetland environments (Hartman et al. 1987)

Google Earth Image of an existing siphon beneath the Needmore Diversion Channel in the Salt Bayou complex

(3) LOCATION INFORMATION

The freshwater inflows/siphons project is located are the Texas Coastal Management Program Coastal Zone Boundary. Thus, it is within the area where projects may be eligible for RESTORE Act funding. Any design or engineering work performed outside the geographical limits is eligible for RESTORE funding because those services contribute directly to a project that will significantly improve the ecosystems of the Gulf coast.

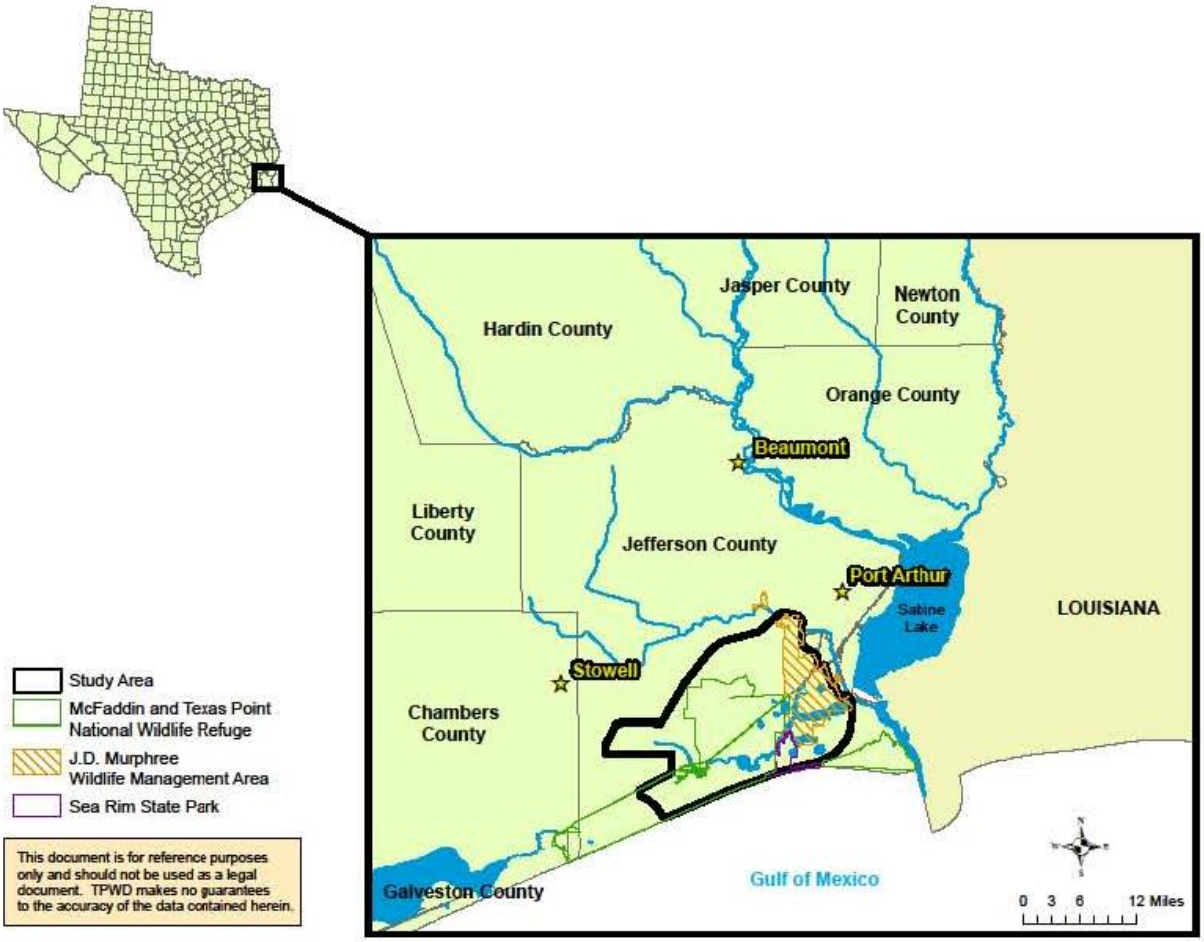


Figure 1. Location and extent of Salt Bayou Marsh study area.

Reference coordinates within the Salt Bayou study area are:

29.760 Degrees North Latitude

94.050 Degrees West Longitude

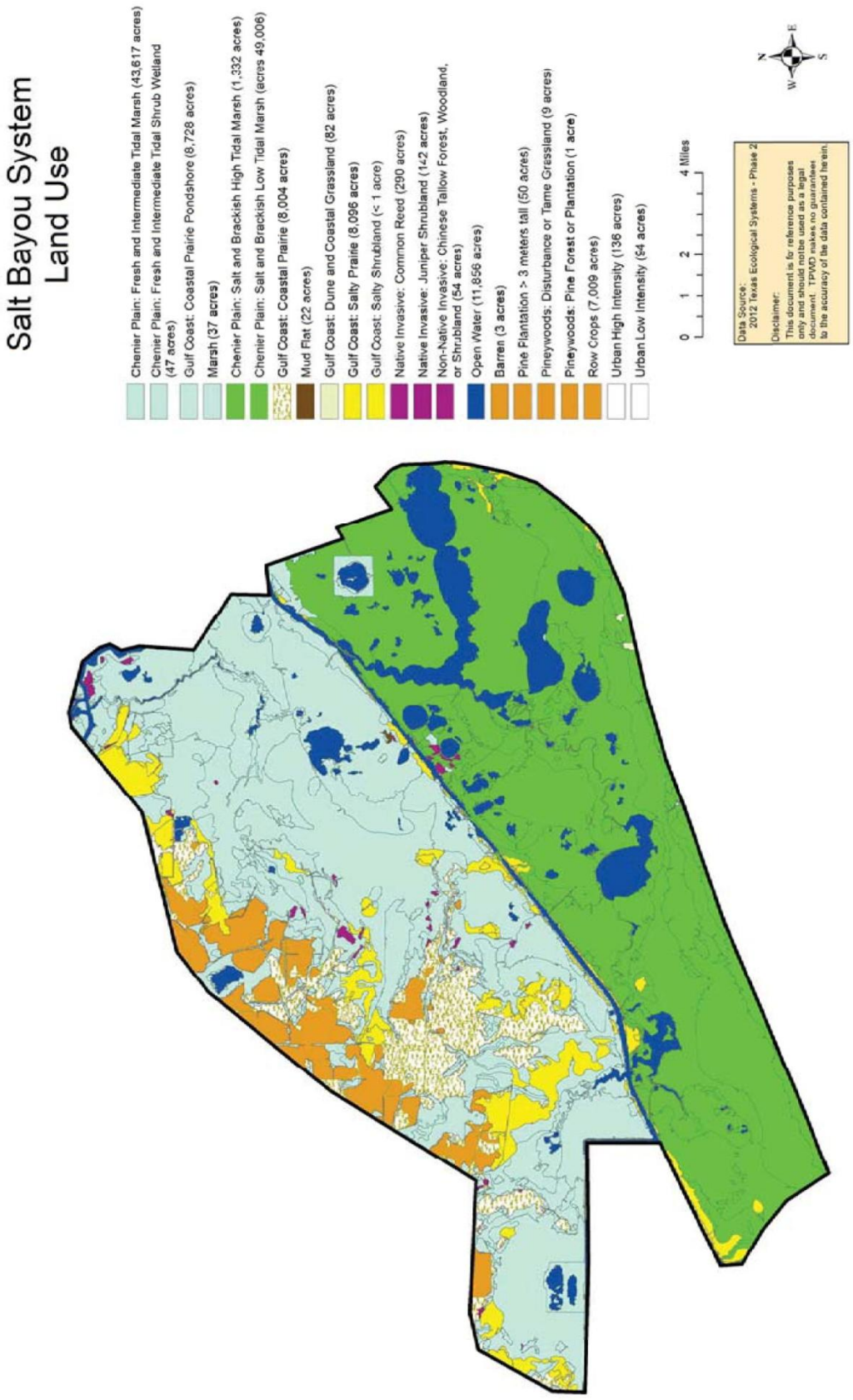
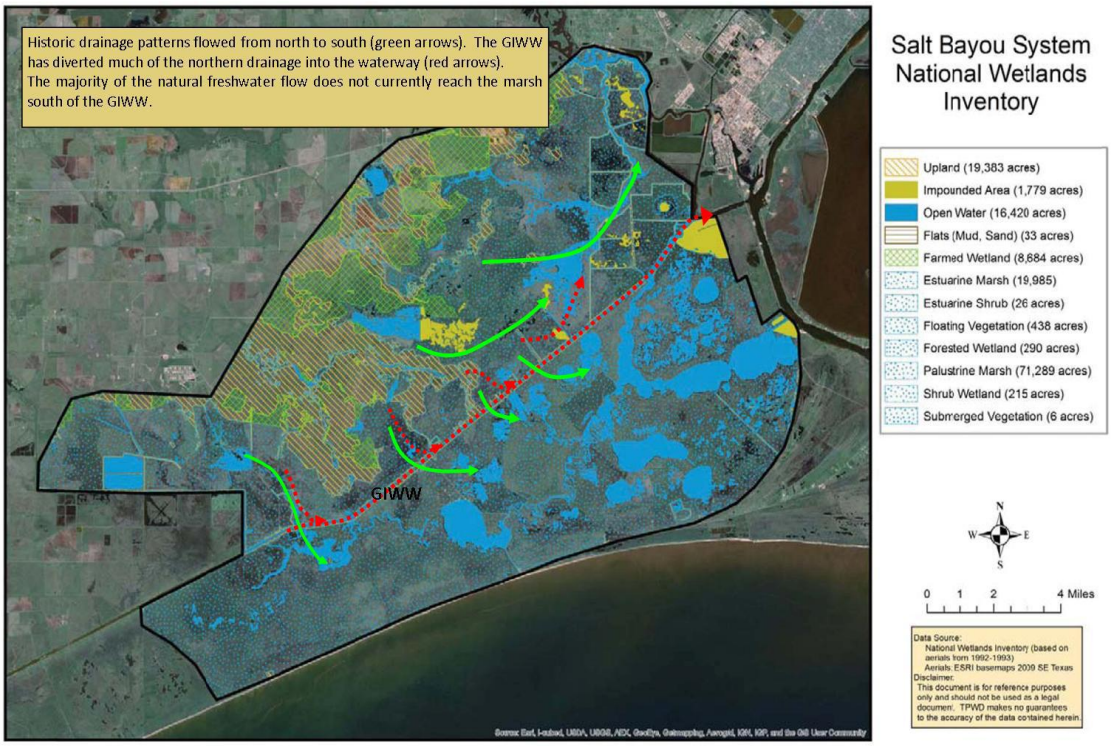


Figure 2. Texas Parks and Wildlife vegetation classification of the Salt Bayou System.


Historic drainage patterns flowed from north to south (green arrows). The GIWW has diverted much of the northern drainage into the waterway (red arrows).
The majority of the natural freshwater flow does not currently reach the marsh south of the GIWW.
GIWW
Salt Bayou System National Wetlands Inventory
Upland (19,383 acres)
Impounded Area (1,779 acres)
Open Water (16,420 acres)
Flats (Mud, Sand) (33 acres)
Farmed Wetland (8,884 acres)
Estuarine Marsh (19,985)
Estuarine Shrub (26 acres)
Floating Vegetation (438 acres)
Forested Wetland (290 acres)
Palustrine Marsh (71,289 acres)
Shrub Wetland (215 acres)
Submerged Vegetation (6 acres)
N
W
E
S
0 1 2 4 Miles
Data Source:
National Wetlands Inventory (based on aerials from 1992-1993)
Aerials: ESRI basemaps 2009 SE Texas
Disclaimer:
This document is for reference purposes only and should not be used as a legal document. TPWD makes no guarantees to the accuracy of the data contained herein.

(5) COST ESTIMATES

Estimates of the effort required through NEPA compliance consist of pre-project monitoring and analysis including field effort, preliminary engineering necessary to adequately describe project elements and alternatives, preparation of NEPA documentation materials, and interagency coordination of materials and results through approval of the NEPA document.

Pre-construction engineering, design, and permitting costs are typically estimated for planning purposes to be 10% of total project cost. Assuming a total project cost of roughly $15 million for two inverted siphon locations along the GIWW yields about $1.5 million of pre-construction costs. If the current request is to be limited to services provided only through NEPA clearance, this number should be reduced by $300,000 of services that would be rendered before construction but after the NEPA clearance. For this project case, however, a similar amount ($300,000) should be allocated to pre-project monitoring/data collection and analysis to establish the hydrologic and hydraulic baseline conditions needed to develop and evaluate alternatives and for the development of criteria for success and design parameters. Thus, the current request is in the amount of $1.5 million.

Salt Bayou Freshwater Inflows Restoration: Feasibility Study, Design, Engineering & Permitting Estimated Cost	
Project Planning and Coordination	$80,000

Survey and Other Data Collection including pre-project monitoring	$400,000
Alternatives Analysis--Feasibility Study-Constructability	$325,000
Preliminary Engineering of Alternatives and Design of Selected Alternative	$375,000
NEPA including document and public involvement process	$215,000
Permitting, e.g., USACE, USCG, TGLO, TCEQ	$105,000
TOTAL PROJECT COST	**$ 1,500,000**

(6) ENVIRONMENTAL COMPLIANCE CHECKLIST (APPENDIX B)

Appendix B

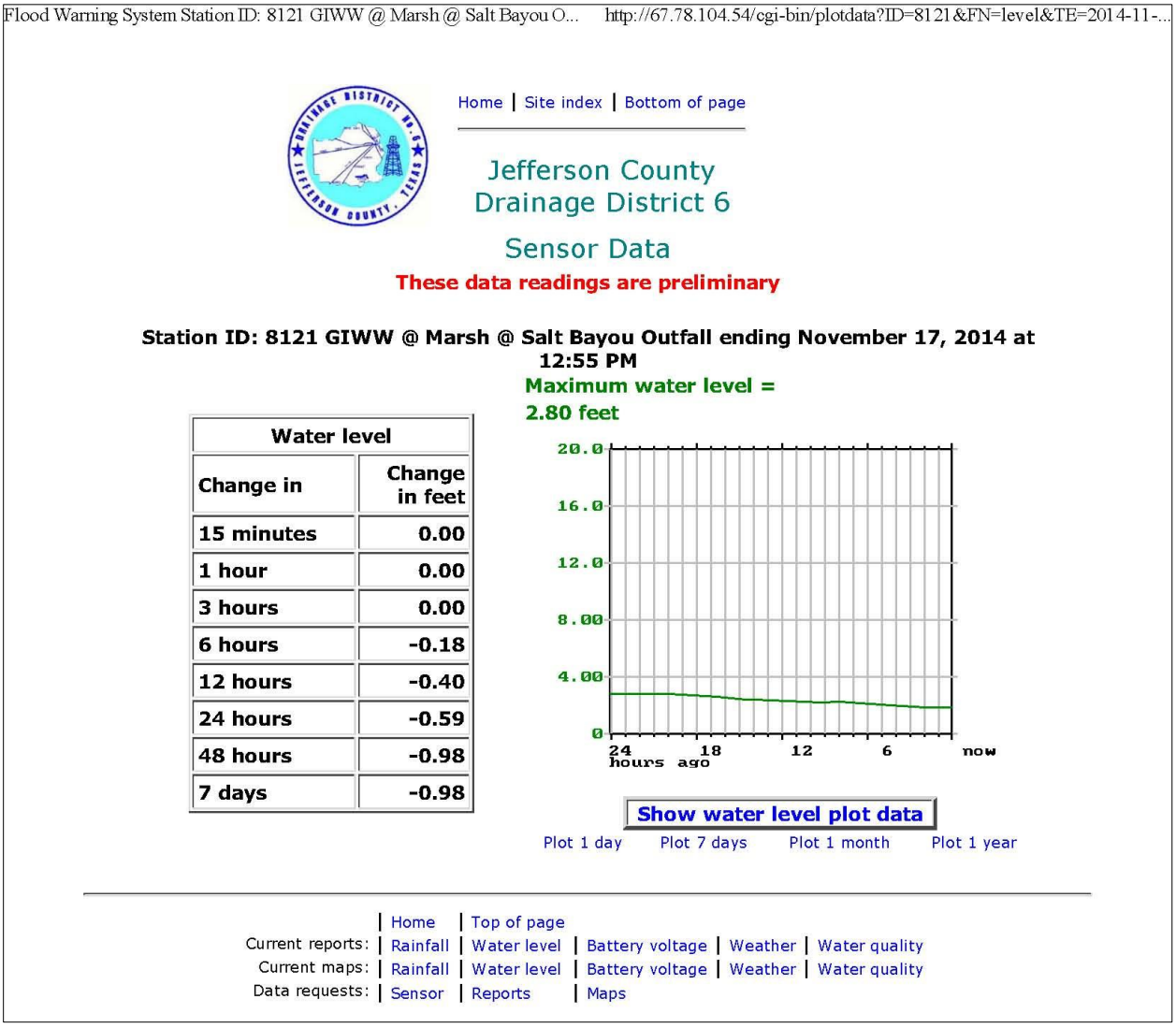
Gulf Coast Ecosystem Restoration Council
Environmental Compliance Checklist

Please check all federal and state environmental compliance and permit requirements as appropriate to the proposed project/program

Environmental Compliance Type	**Yes**	**No**	**Applied For**	**N/A**
Federal				
National Marine Sanctuaries Act (NMSA)		x		
Coastal Zone Management Act (CZMA)	x			
Fish and Wildlife Coordination Act		x		
Farmland Protection Policy Act (FPPA)		x		
NEPA – Categorical Exclusion TO BE DETERMINED				
NEPA – Environmental Assessment TO BE DETERMINED				
NEPA – Environmental Impact Statement TO BE DETERMINED				
Clean Water Act – 404 – Individual Permit (USACOE)		x		
Clean Water Act – 404 – General Permit(USACOE)		x		
Clean Water Act – 404 – Letters of Permission(USACOE)		x		
Clean Water Act – 401 – WQ certification		x		
Clean Water Act – 402 – NPDES		x		
Rivers and Harbors Act – Section 10 (USACOE)		x		
Endangered Species Act – Section 7 – Informal and Formal Consultation (NMFS, USFWS)		X		
Endangered Species Act – Section 7 - Biological Assessment (BOEM,USACOE)		X		
Endangered Species Act – Section 7 – Biological Opinion (NMFS, USFWS)		x		
Endangered Species Act – Section 7 – Permit for Take (NMFS, USFWS)		x		
Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat (EFH) – Consultation (NMFS)		X		
Marine Mammal Protection Act – Incidental Take Permit (106) (NMFS, USFWS)		X		
Migratory Bird Treaty Act (USFWS)		x		
Bald and Golden Eagle Protection Act – Consultation and Planning (USFWS)		x		
Marine Protection, Research and Sanctuaries Act – Section 103 permit (NMFS)		X		
BOEM Outer Continental Shelf Lands Act – Section 8 OCS Lands Sand permit		X		
NHPA Section 106 – Consultation and Planning ACHP, SHPO(s), and/or THPO(s)		X		
NHPA Section 106 – Memorandum of Agreement/Programmatic Agreement		x		
Tribal Consultation (Government to Government)		x		
Coastal Barriers Resource Act – CBRS (Consultation)		x		
State TEXAS				
As Applicable per State NO ADDITIONAL REQUIREMENTS				

(7) DATA/INFORMATION SHARING PLAN

Data collection, evaluation, and dissemination will continue within and among the various participating agencies of the Salt Bayou Marsh Workgroup. Example output of ongoing data collection and dissemination efforts follow:


Flood Warning System Station ID: 8121 GIWW @ Marsh @ Salt Bayou O... http://67.78.104.54/cgi-bin/plotdata?ID=8121&FN=level&TE=2014-11-...

Home | Site index | Bottom of page

Jefferson County
Drainage District 6

Sensor Data

These data readings are preliminary

Station ID: 8121 GIWW @ Marsh @ Salt Bayou Outfall ending November 17, 2014 at 12:55 PM

Maximum water level = 2.80 feet

Water level	
Change in	Change in feet
15 minutes	0.00
1 hour	0.00
3 hours	0.00
6 hours	-0.18
12 hours	-0.40
24 hours	-0.59
48 hours	-0.98
7 days	-0.98

Show water level plot data

Plot 1 day Plot 7 days Plot 1 month Plot 1 year

| Home | Top of page
Current reports: | Rainfall | Water level | Battery voltage | Weather | Water quality
Current maps: | Rainfall | Water level | Battery voltage | Weather | Water quality
Data requests: | Sensor | Reports | Maps

Additional opportunities for data collection, dissemination, and collaborative research will no doubt arise as a result of ongoing SBP implementation.

(8) Reference List of Literature Cited

Barras, J. A., Brock, J. C., Morton, R. A., and Travers, L. J., 2010. Satellite images and aerial photographs of the effects of hurricanes Gustav and Ike on coastal Louisiana. U. S. Geological Survey Data Series 566. http://pubs.usgs.gov/ds/566/ (accessed November 10, 2014).

Boesch, D. F., M. N. Josselyn, A.J. Mehta, J. T. Morris, W.K. Nuttle, C.A. Simestad, and D.J.P. Swift. 1994 . Scientific assessment of coastal wetland loss, restoration and management in Louisiana. *Journal of Coastal Research, Special Issue* No. 20

German, Duane and Marian O'Brien. 2002. *Salt Bayou Watershed Open Water Trend Analysis.* TPWD RP R0400-872, Texas Parks and Wildlife Dept. Report, Austin, TX.

German, Duane. 2013. *Salt Bayou Watershed Open Water Change Detection, 2001-2012.* Texas Parks and Wildlife Dept., Austin, TX.

Haas, J. L., K. A. Rose, B. Fry, T. J. Minello, L. P. Rozas. 2004. Brown shrimp on the edge: linking habitat to survival using an individual-based simulation model. *Ecological Applications* 14(4): 1232-1247.

Leatherwood, Art. 2010. Gulf Intracoastal Waterway, *Handbook of Texas Online* (http://www.tshaonline.org/handbook/online/articles/rrg04) (accessed Nov. 20, 2014). Texas State Historical Association, Austin, Texas.

Minello, T. J. and L. P. Rozas. 2002. Nekton in Gulf Coast wetlands: fine-scale distributions, landscape patterns, and restoration implications. *Ecological Applications* 12(2): 441-455.

Pothina, Dharhas and Carla G. Guthrie, Ph.D. 2009. *Evaluating Inverted Siphons as a Means of Mitigating Salinity Intrusion in the Keith Lake/Salt Bayou System, Jefferson County, Texas.* Texas Water Development Board Surface Water Resources Division, Austin, Texas.

Paine, J. G., S. Mathew, and T. Caudle. 2012. Historical shoreline change through 2007, Texas Gulf Coast: Rates, contributing causes, and Holocene context. *GCAGS Journal* 1: 13-26. http://www.gcags.org/Journal/2012.gcags.journal/GCAGS.Journal.2012.vol1.p13-26.Paine.et.al.pdf (accessed Nov. 11, 2012).

Texas Parks & Wildlife Department (TPWD). 2013. *Salt Bayou Watershed Restoration Plan*. Salt Bayou Workgroup, Houston, Texas, http://www.tpwd.state.tx.us/publications/pwdpubs/media/salt_bayou_plan.pdf . (accessed Nov. 8, 2014).

Texas Parks & Wildlife Department, Coastal Soil and Water Conservation District, and USDA Soil Conservation Service (TPWD et al.). 1976. *Keith Lake Water Exchange Pass. Fish and Wildlife Development RC&D Measure Plan*. 48-6001-245-194. Texas Parks & Wildlife Department, Austin, Texas.

United States Fish and Wildlife Service (USFWS). 2010. *Restoration of the Salt Bayou System by diverting freshwater inflows and other wetland improvements on McFaddin National Wildlife Refuge, Jefferson County, Texas. Final Environmental Assessment*. Division of Planning, National Wildlife Refuge System, Southwest Region. Albuquerque, New Mexico.

United States Fish and Wildlife Service (USFWS). 2008. *Texas Chenier Plain Refuge Complex: final environmental impact statement, comprehensive conservation plan, and land protection plan*. Division of Planning, National Wildlife Refuge System, Southwest Region. Albuquerque, New Mexico.

(9) LETTERS OF SUPPORT

Jefferson County Courthouse
P.O. Box 4025
Beaumont, Texas 77704

Beaumont (409) 835-8466
Pt. Arthur (409) 727-2191 Ext. 8466
Facsimile (409) 839-2311

JEFF R. BRANICK
County Judge

November 17, 2014

Commissioner Toby Baker
Texas Commission on Environmental Quality
P.O. Box 13087, MC 100
Austin, TX 78711-3087

Re: Jefferson County support for Texas Nomination for Siphon Component of Salt Bayou Watershed

Dear Commissioner Baker,

On behalf of Jefferson County Commissioners Court I am pleased to strongly endorse the State of Texas' nomination for funding the preconstruction costs to the siphon installation as part of the Salt Bayou Watershed Restoration Plan to be submitted to the Gulf Coast Ecosystem Restoration (GCER) Council.

Jefferson County is eager to participate in the implementation of the RESTORE Act and we fully endorse your project application's description of the ecosystem threats to the Salt Bayou Watershed. We agree that restoration of the coastal marsh will help counter and reverse the troubling long term trends in Texas' coastal deterioration and marsh loss. We agreed with Congress's intent when it passed the RESTORE Act and pledged the support of the nation to investing in the ecology and economy of a region that has produced 90% of the America's off-shore energy resources and is home to critically important natural resources that were badly damaged by the *Deepwater Horizon* oil spill.

No natural resource was more damaged by *Deepwater Horizon* than water, and no location was harmed more than the Gulf's coastal marsh ecosystems. Your GCER Council application directly addresses those realities in a location where vitally important restoration objectives of the RESTORE Act can be met.

Jefferson County is dedicated to partnering with the State of Texas and the GCER Council to meet those important goals just as we have done through investment of our time, energy and financial resources in the development of the Salt Bayou Watershed Restoration Plan that resulted from intensive stakeholder partnering and which clearly prioritizes the very objectives of Texas' application to the GCER Council.

Sincerely,

Jeff R. Branick
County Judge

November 17, 2014

Commissioner Toby Baker
Texas Commission on Environmental Quality
P.O. Box 13087, MC 100
Austin, TX 78711-3087

Re: Ducks Unlimited support for Texas Nomination for Siphon Component of Salt Bayou Watershed

Dear Commissioner Baker,

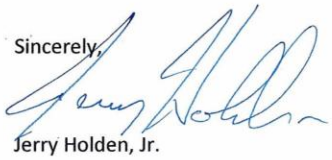
On behalf of the Southern Regional Office of Ducks Unlimited I am pleased to endorse the State's Texas nomination to the Gulf Coast Ecosystem Restoration (GCER) Council seeking engineering, design and preconstruction funding to install two siphons to convey fresh water into the Salt Bayou Watershed from the north side of the Gulf Intercoastal Waterway (GIWW) to the south side, in Jefferson County, Texas.

Ducks Unlimited has had a long term focus on the Upper Texas coastal wetlands and DU is a planning partner and signatory to the Salt Bayou Watershed Restoration Plan that began as a stakeholder project in 2000 and had its recommendations adopted by the group in 2013. The Salt Bayou Plan (SBP) endorses the use of siphons to convey fresh water into the Salt Bayou Watershed beneath the GIWW and thereby lower salinity levels on the coastal side of the canal that pose a serious ongoing threat to the health of the largest coastal estuarine marsh in Texas.

Coastal Texas is part one of the most important wintering areas for waterfowl on the continent. It is critical that we seize any opportunity to restore and enhance these habitats. Such actions represent ecological wins, but they also help the local communities that are intrinsically tied to the resource through their economies.

Thank you for your leadership in seeking GCER Council funding for the preconstruction costs of the installation of two siphons as part of Texas' approach to *Deepwater Horizon* restoration of the Gulf of Mexico ecosystem.

Sincerely,



Jerry Holden, Jr.
Director of Conservation Programs
Southwest Conservation Unit
Ducks Unlimited, Inc.

TEXAS GENERAL LAND OFFICE
JERRY PATTERSON, COMMISSIONER

November 20, 2014

Commissioner Toby Baker
Texas Commission on Environmental Quality
P.O. Box 13087, MC 100
Austin, TX 78711-3087

Re: Salt Bayou Siphons: Feasibility Study, Design, Engineering and Permitting

Dear Commissioner Baker:

Please accept this letter of support from the Texas General Land Office for the Bucket 2, Round 1 Phase of RESTORE. This project will provide the funding needed to design the use of passive inverted siphons to reconnect freshwater inflow from the northern to the southern portions of the marsh to lower the salinity south of the GIWW.

This project will have direct, positive effects on the McFaddin National Wildlife Refuge, Sea Rim State Park, and the J.D. Murphree Wildlife Management Area, each of which is wholly or in part within the Salt Bayou Watershed and is consistent with the Salt Bayou Watershed Plan.

The project lays the foundation for the restoration of thousands of acres of estuarine emergent marsh through improving the water quality in the lower Salt Bayou marsh complex. The habitats restored through this project are important to the life cycles, and therefore the sustainability, of many ecologically and economically significant marine species. The contributions of such natural resources on the ecology and economy of Texas are, in a major way, dependent upon the Salt Bayou Watershed having habitat suitable to their development. Restoration of estuarine habitats is especially important not only to maintain essential habitat for commercially and recreationally important marine species, but also for their prey species, as so many of the prey species are also estuarine dependent. The marsh edge, in particular, serves as a critical transition between the emergent marsh vegetation and open water by providing a gateway for the movement of organisms and nutrients between intertidal and subtidal estuarine environments.

If you have any questions or concerns, please contact me at (512) 463-5058 or at Sheri.Land@glo.texas.gov

Sincerely,

Sheri Land

Sheri Land
Director of Grant Programs and Support, Coastal Resources
Texas General Land Office

Stephen F. Austin Building • 1700 North Congress Avenue • Austin, Texas 78701-1495
Post Office Box 12873 • Austin, Texas 78711-2873
512-463-5001 • 800-998-4GLO
www.glo.state.tx.us

ELIGIBILITY REVIEW

Bucket 2 – Council Selected Restoration Component

PROPOSAL TITLE

Texas Salt Bayou Freshwater Inflows Restoration: Feasibility Study, Design, Engineering & Permitting

PROPOSAL NUMBER

TX-5

LOCATION

Jefferson County, Texas

SPONSOR(S)

Texas

TYPE OF FUNDING REQUESTED (Planning, Technical Assistance, Implementation)

Planning

REVIEWED BY:

Bethany Carl Kraft/ Ben Scaggs

DATE:

November 21, 2014

1. Does the project aim to restore and/or protect natural resources, ecosystems, fisheries, marine and wildlife habitat, beaches, coastal wetlands and economy of the Gulf Coast Region?

◉ YES ○ NO

Notes:

Proposal seeks funding to design the use of passive inverted siphons to reconnect saltwater inflow from the northern to the southern portions of the marsh to lower the salinity south of the Gulf Intracoastal Waterway.

2. Is the proposal a project?

◉ YES ○ NO

If yes, is the proposed activity a discrete project or group of projects where the full scope of the restoration or protection activity has been defined?

◉ YES ○ NO

Notes:

3. Is the proposal a program?

◯ YES ◉ NO

If yes, does the proposed activity establish a program where the program manager will solicit, evaluate, select, and carry out discrete projects that best meet the program's restoration objectives and evaluation criteria?

◯ YES ◯ NO

Notes:

4. Is the project within the Gulf Coast Region of the respective Gulf States?

◉ YES ◯ NO

If no, do project benefits accrue in the Gulf Coast Region?

◯ YES ◯ NO

Notes:

Eligibility Determination

ELIGIBLE

Additional Information

Proposal Submission Requirements

1. Is the project submission overall layout complete? ***Check if included and formatted correctly.***

A. Summary sheet	☑	F. Environmental compliance checklist	☑
B. Executive summary	☑	G. Data/Information sharing plan	☑
C. Proposal narrative	☑	H. Reference list	☑
D. Location information	☑	I. Other	☑
E. High level budget narrative	☑		

If any items are NOT included - please list and provide details

2. Are all proposal components presented within the specified page limits (if applicable)?

◉ YES ○ NO

Notes: