Mississippi Dept of Marine Resources
PERMITTING
APR 06 2016
RECEIVED

JOINT APPLICATION AND NOTIFICATION

U.S. ARMY CORPS OF ENGINEERS
MISSISSIPPI DEPARTMENT OF MARINE RESOURCES
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY/OFFICE OF POLLUTION CONTROL

This form is to be used for proposed activities in waters of the United States in Mississippi and for the erection of structures on suitable sites for water dependent industry. Note that some items, as indicated, apply only to projects located in the coastal area of Hancock, Harrison and Jackson Counties.

1. Date ~~3-24-16~~ 4-5-16 CR
month day year

2. Applicant name, mailing address, phone number and email address:
Dale Diaz (MDMR)
1141 Bayview Ave.
Biloxi, MS 39530
228-297-5244 Dale.Diaz@dmr.ms.gov

Agent name, mailing address, phone number and email address:
MS Dept. of Marine Resources (MDMR)
Marine Fisheries
1141 Bayview Ave.
Biloxi, MS 39530

3. Official use only
COE _____
DMR _____
DEQ _____
A95 _____
DATE RECEIVED _____

4. Project location
Street Address NA City/Community NA
Name of Waterway See Attachment Latitude _____ Longitude (if known) _____
Geographic location: Section _____ Township _____ Range _____ County Harrison

5. **Project description**

New work X **Maintenance work** ____

Dredging

__Channel	length_____	width_____	existing depth_____	proposed depth_____
__Canal	length_____	width_____	existing depth_____	proposed depth_____
__Boat Slip	length_____	width_____	existing depth_____	proposed depth_____
__Marina	length_____	width_____	existing depth_____	proposed depth_____
__Other-Mooring Basin	length_____	width_____	existing depth_____	proposed depth_____

Cubic yards of material to be removed _____ Type of material _____
Location of spoil disposal area _____
Dimensions of spoil area _____ Method of excavation _____
How will excavated material be contained? _____

Construction of structures

____Bulkhead	Total length_____	Height above water_____	
____Pier	length_____	width_____	height_____
____Boat Ramp	length_____	width_____	slope_____
____Boat House	length_____	width_____	height_____

____Structures on designed sites for water dependent industry (Coastal area only). Explain in item 11 or include as attachment.
X Other (explain) See Attachment.

Filling
Dimensions of fill area _____
Cubic yards of fill _____ Type of fill _____

Other regulated activities (i.e. Seismic exploration, burning or clearing of marsh) Explain.

6. **Additional information relating to the proposed activity**

Does project area contain any marsh vegetation? Yes _____ No X

(If yes, explain)_____

Is any portion of the activity for which authorization is sought now complete? Yes_____ No X

(If yes, explain) NA

Month and year activity took place NA

If project is for maintenance work on existing structures or existing channels, describe legal authorization for the existing work. Provide permit number, dates or other form(s) of authorization. No

Has any agency denied approval for the activity described herein or for any activity that is directly related to the activity described herein?

Yes_____ No X (If yes, explain)_____

7. **Project schedule**

Proposed start date August 2016 Proposed completion date November 2016

Expected completion date (or development timetable) for any projects dependent on the activity described herein. NA

8. **Estimated cost of the project** $240,000 depending on which methods of off-bottom aquaculture are used.

9. **Describe the purpose of this project. Describe the relationship between this project and any secondary or future development the project is designed to support.** This off-bottom aquaculture lease site is being aquired by the MS Dept. of Marine Resources with the intention to sub-lease 1 to 5 acres sections to shellfish aquaculturist who are interested in off-bottom aquaculture businesses. MDMR intends to sponsor training programs that helps new aquaculturist with all aspects of operating a shellfish aquaculture operation from inception through one harvest cycle.

Intended use: Private_____ Commercial X Public_____ Other (Explain)_____

10. **Describe the public benefits of the proposed activity and of the projects dependent on the proposed activity. Also describe the extent of public use of the proposed project.**

See Attachment

11. **Narrative Project Description:**

In February 2015, MS Governor Phil Bryant estabilished the Governor's Oyster Council on Restoration and Resiliency. One of the primary recommendations of the Oyster Council was to increase oyster production by encouraging aquaculture in the State.

MDMR is seeking to lease this locations within the MS Sound and adjaecent waters. This lease will be sub-divided into one to five acre sections and sub-leased to individuals interested in pursuing off-bottom shellfish aquaculture businesses. MDMR intends to sponsor a shellfish aquaculture training program, that trians new aquaculturist in all aspects of operating a shellfish aquaculture business from inception through one harvest cycle. There are three off-bottom culture methods that are being considered for this training program:

1. Suspended basket or longline system - (see attachment 1. for discription and diagram).
2. Floating basket system - (see attachment 2. for discription and diagram).
3. Off- bottom basket system - (see attachment 3. for discription and diagram) find attachment and discription..

12. Provide the names and addresses of the adjacent property owners. Also identify the property owners on the plan view of the drawing described in Attachment "A". (Attach additional sheets if necessary.)

1. Between the bridges in Saint Louis Bay is outside of raprian rights zone as provided by Mississippi Law.

   See attachment for names and addresses of adjacent property owners.

2.

13. List all approvals or certifications received or applied for from Federal, State and Local agencies for any structures, construction, discharges, deposits or other activities described in this application. Note that the signature in Item 14 certifies that application has been made to or that permits are not required from the following agencies. If permits are not required, place N/A in the space for Type Approval.

Agency	*Type Approval*	*Application Date*	*Approval Date*
Dept. of Environmental Quality			
Dept. of Marine Resources			
Army Corps of Engineers			
City/County_____			
Other_____			

14. Certification and signatures

Application is hereby made for authorization to conduct the activities described herein. I agree to provide any additional information/data that may be necessary to provide reasonable assurance or evidence to show that the proposed project will comply with the applicable state water quality standards or other environmental protection standards both during construction and after the project is completed. I also agree to provide entry to the project site for inspectors from the environmental protection agencies for the purpose of making preliminary analyses of the site and monitoring permitted works. I certify that I am familiar with and responsible for the information contained in this application, and that to the best of my knowledge and belief, such information is true, complete and accurate. I further certify that I am the owner of the property where the proposed project is located or that I have a legal interest in the property and that I have full legal authority to seek this permit.

U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willingly falsifies, conceals, or covers up by any trick, scheme or device a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statement or entry, shall be fined not more than $10,000 or imprisoned not more than five years, or both.

Mississippi Coastal Program (Coastal area only)

I certify that the proposed project for which authorization is sought complies with the approved Mississippi Coastal Program and will be conducted in a manner consistent with the program.

Dale A. Diaz
Signature of Applicant or Agent

4/5/16
Date

15. Fees

Payable to MS Dept. of Marine Resources
$50.00 Single-family residential application fee
$500.00 Commercial application fee
Public notice fee may be required

Please include appropriate fees for all projects proposed in coastal areas of Hancock, Harrison and Jackson Counties.

16. If project is in Hancock, Harrison or Jackson Counties, send one completed copy of this application form and appropriate fees listed in Item 15 to:

Department of Marine Resources
Bureau of Wetlands Permitting
1141 Bayview Avenue
Biloxi, MS 39530
(228) 374-5000

If project IS NOT in Hancock, Harrison or Jackson Counties, send one completed copy of this application form to each agency listed below:

District Engineer
Mobile District
Attn: CESAM-RD
P.O. Box 2288
Mobile, AL 36628-0001

District Engineer
Vicksburg District
Regulatory Branch
Attn: CEMVK-OD-F
4155 Clay Street
Vicksburg, MS 39183-3435

Director
Mississippi Dept. of Environmental Quality
Office of Pollution Control
P.O. Box 10385
Jackson, MS 39289

17. In addition to the completed application form, the following attachments are required:

Attachment "A" Drawings

Provide a vicinity map showing the location of the proposed site along with a written description of how to reach the site from major highways or landmarks. Provide accurate drawings of the project site with proposed activities shown in detail. All drawings must be to scale or with dimensions noted on drawings and must show a plan view and cross section or elevation. Use 8 1/2 x 11" white paper or drawing sheet attached.

Attachment "B" Authorized Agent

If applicant desires to have an agent or consultant act in his behalf for permit coordination, a signed authorization designating said agent must be provided with the application forms. The authorized agent named may sign the application forms and the consistency statement.

Attachment "C" Environmental Assessment *(Coastal Area Only)*

Provide an appropriate report or statement assessing environmental impacts of the proposed activity and the final project dependent on it. The project's effects on the wetlands and the effects on the life dependent on them should be addressed. Also provide a complete description of any measures to be taken to reduce detrimental offsite effects to the coastal wetlands during and after the proposed activity. Alternative analysis, minimization and mitigation information may be required to complete project evaluation.

Attachment "D" Variance or Revisions to Mississippi Coastal Program *(Coastal area only)*

If the applicant is requesting a variance to the guidelines in Section 2, Part III or a revision to the Coastal Wetlands Use Plan in Section 2, Part IV of the Rules, Regulations, Guidelines and Procedures of the Mississippi Coastal Program, a request and justification must be provided.

Attachment "A" Drawings

Attachment for Joint Application and Notification

Name of Waterways:

Site 1. The Mouth of Saint Louis Bay.

Site 1. 24 acres (Attachment 4)

SITE	LAT	LONG
NW CORNER	30.31728	-89.30118
NE CORNER	30.31693	-89.29749
SW CORNER	30.31457	-89.30117
SE CORNER	30.31459	-89.29749

5. Other: Off-bottom oyster aquaculture lease site with 8 inch diameter pilings for markers and aquaculture operations (maximum of up to 40 pilings per acre depending on aquaculture method implemented).

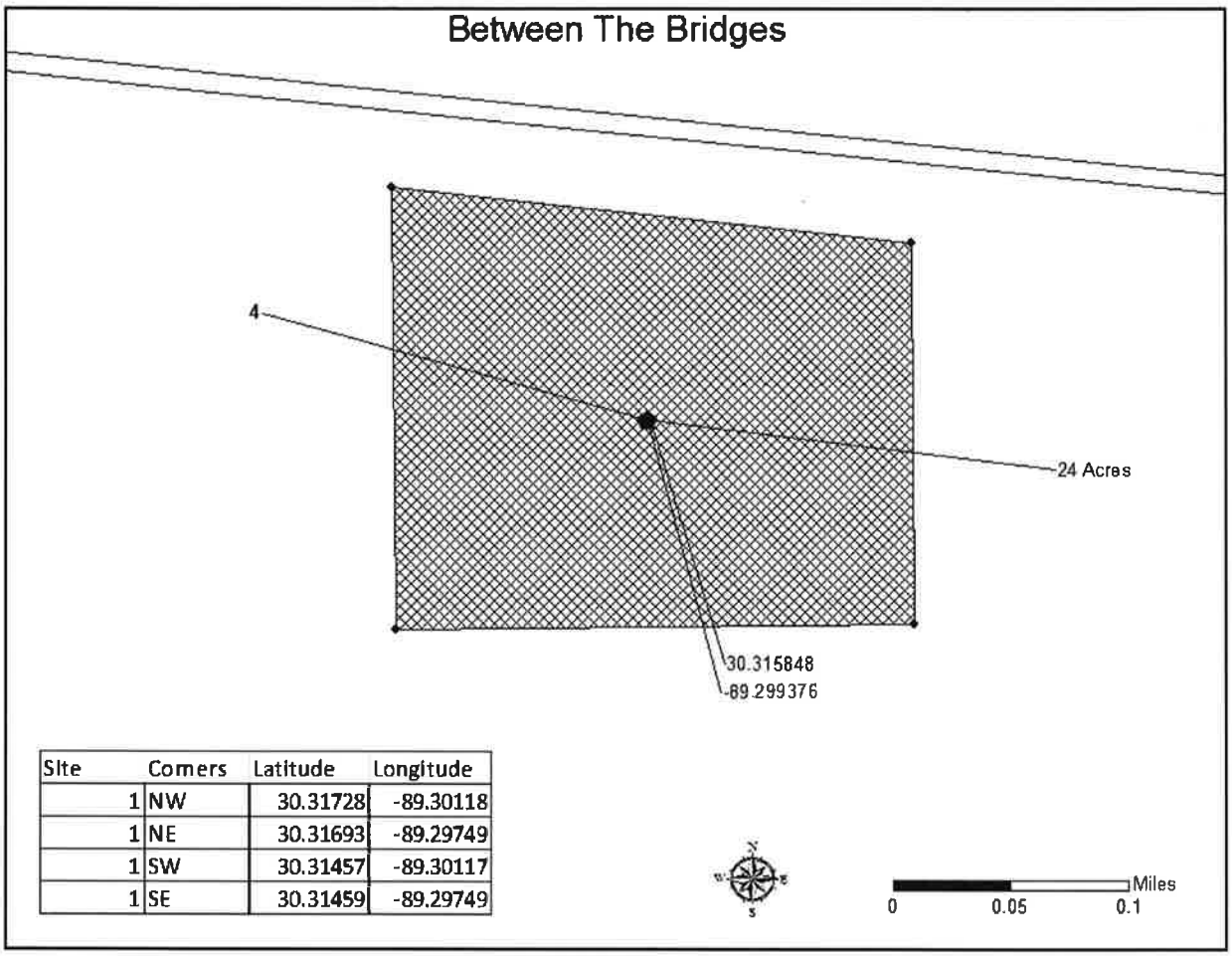
10. Describe the public benefit s of the proposed activity and of the projects dependent on the proposed activity. Also describe the extent of public use of the proposed project.

The project will provide jobs as well as a product that is in high demand from processors, restaurants and consumers. The creation of this off-bottom aquaculture sites will also create valuable near shore habitat that will support and sustain healthy populations of estuarine fish and other invertebrates.

12. Provide the names and addresses of the adjacent property owners. Also identify the property owners on the plan view of the drawing described in Attachment "A".

Site 1. Between the bridges in Saint Louis Bay is outside of riparian rights zone as provided by Mississippi Law.

Between The Bridges



Site	Corners	Latitude	Longitude
1	NW	30.31728	-89.30118
1	NE	30.31693	-89.29749
1	SW	30.31457	-89.30117
1	SE	30.31459	-89.29749

Property Owners Adjacent to Site 4-Between the Bridges in Saint Louis

ARCEL_ID	OWNER	ADDRESS	CITY	ST	ZIP
0213K-01-019.000	RITTER THERESE L MD	4515 SUGAR OAKS DRIVE	NEW IBERIA	LA	70563
0213F-01-007.000	FITZPATRICK JERRY-TRUSTEE-	725 DUNBAR AVE	BAY ST LOUIS	MS	39520
0213F-01-009.000	KOERNER JOHN E III	17 AUDUBON PL	NEW ORLEANS	LA	70118
0213F-01-010.000	SCHMEDTJE STEPHEN A JR	462 WALNUT ST	NEW ORLEANS	LA	70118-4932
0213K-01-018.000	SCOTT D P	3514 ASH GLEN DR	SPRING	TX	77388
0213K-01-020.000	LAND TRUST FOR THE MS COASTAL PLAIN	P O BOX 245	BILOXI	MS	39533
0213F-01-008.000	PERRIER GUY D & MCKENZIE HOLLY	1314 JACKSON AVE	NEW ORLEANS	LA	70130
0213G-03-059.001	PAYNE JOHN WILLIAM R & MACHELLE W	1444 HENRY CLAY AVENUE	NEW ORLEANS	LA	70118
0213G-03-057.000	STEWART PETER GORDON & ANNE M	14 DOGWOOD DR	COVINGTON	LA	70433
0213G-03-051.000	BINDER ELAINE C J & RIGGS C J	1004 SMITH DRIVE	METAIRIE	LA	70005
0213G-03-046.000	GLEASON CANDIS & OLSEN RICHARD M	717 FRONT ST	PASS CHRISTIAN	MS	39571
0213G-03-039.000	PELICAN COVE MARINA LLC	P O BX 6122	DIAMONDHEAD	MS	39525
0213G-03-050.000	BINDER ELAINE C J & RIGGS C J	1004 SMITH DRIVE	METAIRIE	LA	70005
0213F-01-012.000	TRAPOLIN FAMILY LLC	639 JULIA STREET	NEW ORLEANS	LA	70130
0213K-01-012.000	TRAPOLIN FAMILY LLC	639 JULIA STREET	NEW ORLEANS	LA	70130
0213G-03-060.000	WEISS ALEXANDER TIBLIER	3935 TCHOUPITOULAS #C	NEW ORLEANS	LA	70115
0213G-03-059.000	BOOKBINDER RONALD & MCCALLUM JILL	215 FRONT ST	PASS CHRISTIAN	MS	39571
0213G-03-061.001	LAND TRUST FOR MISS COASTAL PLAIN	PO BOX 245	BILOXI	MS	39533-0490
.13G-03-047.000	SMITH DONALD K & JEAN	715 FRONT STREET	PASS CHRISTIAN	MS	39571
0213F-01-011.000	SCHMEDTJE STEPHEN A JR	462 WALNUT STREET	NEW ORLEANS	LA	70118
0213F-01-006.000	KOERNER JOHN E III	PO Box 650 SUITE 2830	NEW ORLEANS	LA	70130
0213K-01-013.000	LAUREL MISSISSIPPI LLC	18 CHALSTROM DRIVE	RIVER RIDGE	LA	70123
0213G-03-061.000	STARRING MARK G	117 CLEARVIEW PARKWAY	METAIRIE	LA	70001
0213K-01-016.000	JACOBS STANLEY J & PEGGY R	500 ST LOUIS ST	NEW ORLEANS	LA	70130-2118
0213K-01-014.000	NORTON TAYLOR M & KRISTIN U	43 BEVERLY GARDEN DR	METAIRIE	LA	70001
0213K-01-015.000	RITTER DOUGLAS	319 12TH ST	NEW ORLEANS	LA	70124
0213G-03-069.001	KOLB GORDON H	3920 MAGAZINE STREET	NEW ORLEANS	LA	70115
0213G-03-056.000	LARRIEU EARL LEE JR ET AL L/E	921 CHARTRES ST # 16	NEW ORLEANS	LA	70116
0213G-03-069.000	KOLB GORDON H	3920 MAGAZINE ST	NEW ORLEANS	LA	70115
0213G-03-052.000	KOLB GORDON H	3920 MAGAZINE STREET	NEW ORLEANS	LA	70115
0213G-03-062.000	LAND TRUST FOR MISS COASTAL PLAIN	PO BOX 245	BILOXI	MS	39533

Contact for U.S Hwy 90 Bridge.

Mississippi Department of Transportation, Attention Melinda McGrath

401 North West Street

Jackson, MS 39201

0213G-03-062.000
0213G-03-061.001
0213G-03-061.000
0213G-03-060.000
0213G-03-059.000
0213G-03-059.001
0213G-03-057.000
0213G-03-056.000
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0213G-03-046.000
0213G-03-047.000
0213G-03-051.000
0213G-03-050.000
0213G-03-039.000
0213F-01-006.000
0213F-01-007.000
0213F-01-008.000
0213F-01-009.000
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0213F-01-012.000
0213K-01-012.000
0213K-01-013.000
0213K-01-014.000
0213K-01-015.000
0213K-01-016.000
0213K-01-019.000
0213K-01-020.000

Request for Change to the Coastal Wetlands Use Plan

The Mississippi Department of Marine Resources (MDMR) would like to request a change to the Coastal Wetlands Use Plan in order to accommodate anticipated off-bottom oyster aquaculture activities located in Saint Louis Bay, between the US Hwy. 90 Bridge and the CSX Train Bridge. Section 2, Part. IV Figure VIII-4 (Coastal Wetlands Use, Coastal Waters) indicates that the waters within the project area are classified as District G-1 (General Use). The anticipated off-bottom oyster aquaculture activities would include three primary methods (suspended basket or long-line system, floating basket system or the off-bottom basket culture method). All of the methods use cages or baskets primarily made of PVC- coated wire or plastic. When in use, these containers either sit on the bottom or are attached to floats that keep them near the surface or are strung between pilings on long-lines (See the Section Seven Checklist for detailed description of the gear) Changing the use plan would help to accomplish some of the goals laid out in the Governor's Oyster Council on Restoration and Resiliency Final Report such as increasing oyster production in the State and promoting aquaculture. It would also have a positive effect on water quality, commercial and recreational fishing, overall oyster production and the economy. Off-bottom oyster aquaculture has been implemented in many coastal States throughout the US. In the Gulf of Mexico, Florida, Alabama and Louisiana are currently using this technology to increase oyster production in their States.

MDMR is requesting that the agency consider adjusting the Coastal Wetlands Use Plan by changing this area identified to a District S-2 classification (Special Use – Leased wetlands for oyster cultivation).

Justification for this change is outlined in Section 2, Part I.E.2.b.ii., which states "There is a significant public benefit in the activity, impacts to public access and adverse environmental impacts have been minimized, the general public as well as governmental entities were notified of the project, and a public hearing was held".

Environmental Impacts

The aquaculture activities being proposed are the placement of screw in anchors (5-in x 30-in screw-in tie-downs), pilings or off-bottom baskets on the water bottoms and would not have significant environmental impacts to coastal wetlands. These off-bottom aquaculture leases will improve water quality in and near the sites, due to the oysters providing water filtration services as they feed. The creation of these off-bottom aquaculture sites will also create valuable near shore habitat that will support and sustain healthy populations of estuarine fish and other invertebrates. Because, commercial oyster harvesting can cause stress to natural reefs, potentially leading to a loss of resources, off-bottom aquaculture may reduce fishing pressure on the natural oyster reefs of the State by allowing for members of the public to invest in growing and harvesting their own oyster resources. In consideration of the items mentioned

above creating and encouraging off-bottom aquaculture is believed to be beneficial to the environment.

Alternative Sites

MDMR is currently applying for four separate sites to accommodate off-bottom aquaculture, south of Deer Island, south of Henderson Point, between the Bridges in Saint Louis Bay and Cat Island. The purpose of this site selection effort is to acquire some sites in a short timeframe and in areas with water quality classifications suitable for oysters to be sold for direct consumption. Therefore, MDMR staff only considered sites that were in areas that had water quality classification suitable for direct harvest and consumption of oysters and adjacent to publically held lands or areas that are outside of the 750 yard riparian rights zone which are designated by State Law to land owners to cultivate oysters.

In this round of permit applications only areas that were adjacent to publically held lands were considered. The rational considered for only looking in these areas was dealing with private land owners for use of riparian rights leases would be time consuming and add an estimated six to nine months to the permitting process and would be difficult with the requirements State agencies must meet in the current State financial and legal systems. Routine contracts currently take between 90 and 120 days. A contract like this one that involves a long term lease and three different sets of attorneys (MDMR's, MS Secretary of State and the private land owners) would likely take substantially longer. In addition, it is assumed that the legal matters associated with this type of lease are considered to be workable, but challenging and add considerable cost. MDMR currently has short term funding to initiate off-bottom aquaculture, but long term stable funding to pay for long term lease fees, which may be required, with private land owners is not currently secured. Lastly, there is some level of uncertainty when dealing with private land owners. The State of Alabama's Off-bottom Oyster Aquaculture Training Program was unsuccessful in having their riparian rights lease renewed for their initial training site which has caused some unexpected challenges for their program.

After this round of permits are filed, MDMR intends to explore working through the problems mentioned above to see if working with interested private land owners that have land adjacent to suitable areas is feasible (Mississippi Law Code 49-15-9 allows land owner 750 yards from their shore lines to plant, cultivate and gather oysters).

Three other sites were considered but rejected by MDMR staff south of Deer Island (near shore), north of Deer Island (near shore) and south of Menge Avenue in Pass Christian:

- South of Deer Island (near shore) –This site was north of a borrow pit that was dredged to restore the south and west sides of Deer Island. When the shape file was provided to MDMR for the area that was permitted by the US Army Corp of Engineers for the

borrow pit it was determined that the area was too narrow for an off-bottom aquaculture lease site.

- North of Deer Island (near shore) – The area north of Deer island is heavily used for a substantial part of the year by recreational and commercial shrimpers and live bait shrimpers. If a shrimper or live baiter mistakenly pulled their trawls into the off-bottom aquaculture site it could cause substantial damage to the vessel, aquaculture site and the gear. Also, potential navigation concerns were an issue with this site because this area is heavily traveled and used by recreational boaters and fishermen.
- South of Menge Avenue in Pass Christian – This site did not provide a suitable buffer for safe operation of vessels by fishermen using the artificial reef sites. It is positioned between two existing artificial reef sites (Lang Avenue Reef and Japonica Drive Reef) and is 400 ft. away from each site.

Public Interest

The proposed aquaculture activities are being sought to improve oyster availability to consumers, provide jobs to oyster farmers, relieve fishing pressure on public reefs and enhance water quality and will directly benefit the public in several ways. During years of poor oyster availability on public reefs, off-bottom aquaculture will provide a consistent supply of oysters for consumers. By Improving Mississippi's oyster production, off-bottom aquaculture will give oyster fishermen an alternative employment option and will reduce overall harvest effort on public reefs and be beneficial to the economy of the State. Oysters grown in off-bottom aquaculture operations also benefit the recreational and commercial seafood industry by providing valuable habitat for many smaller marine organisms that are utilized as prey for commercially and recreationally important species, such as speckled trout, red drum, black drum, blue crab, etc. Creating these areas will enhance commercial and recreational fishing opportunities. Oysters also play a critical role in filtering the waters of the estuary, which helps to improve overall water quality conditions in our bays and estuaries. Water quality improvements could lead to more desirable conditions for people who enjoy spending time on our coastal beaches and in the waters of the MS Sound. Overall, off-bottom oyster aquaculture serves to improve estuarine and wetland conditions, which supports a greater public interest by which the public can benefit.

Notification of General Public and Government Entities

Notification of the general public and government entities is part of the review process carried out by the coastal program agencies. It is our understanding that before authorization can be given all relevant agencies and the general public will be made aware of the proposed aquaculture activities and the opportunity will be given for them to comment on the project. Project managers welcome comments to the proposed project and will take into consideration any and all input that is relevant to the success of the aquaculture activities being proposed. To date we have received no comments regarding this project.

USACE Biological Assessment &

NMFS Endangered Species Act Section 7 Checklist

A) Project Identification

Lead Agency:

U.S. Army Corp. of Engineers (Mobile District)

Agency Contact:

Allison Monroe
251-690-3228
Allison.F.Monroe@usace.army.mil

Applicant Name/Contact:

Dale Diaz
228-523-4082
Dale.Diaz@dmr.ms.gov

Project Name & ID #:

Mississippi Sound, Saint Louis Bay, Off-bottom Oyster Aquaculture Project (not yet issued)

B) Project Location

1. Address and description of property:
   Site 1. The proposed project site is located in the mouth of Saint Louis Bay between the U.S Hwy 90 Bridge and the CSX Train Bridge outside the riparian rights zones of adjacent property owners. The center of the proposed project site is approximately .55 miles from the west shore line of Henderson point, near the mouth of Bay St. Louis and .13 mile south of the center line of the U.S. Hwy. 90 Bridge.

2. Latitude & Longitude:
   Site 1. 24 acres (Attachment 4)

SITE	LAT	LONG
NW CORNER	30.31728	-89.30118
NE CORNER	30.31693	-89.29749
SW CORNER	30.31457	-89.30117
SE CORNER	30.31459	-89.29749

3. Waterbody:
   The proposed project sites will be located in the following water body:
   Site 1. The Mouth of Saint Louis Bay.

C) Project Site Description

Between the Bridges Off-Bottom Aquaculture Site

1. Existing Structures:
   The proposed site is bounded to the north by the U.S. Hwy 90 Bridge crossing Saint Louis Bay and to the south by a pipeline/cable crossing that runs the width of the mouth of the bay from the shoreline of the City of Pass Christian to the shoreline of the City of Bay St. Louis. This projects northern boundary is approximately .03 miles south the U.S Hwy. 90 Bridge and the southern boundary is approximately .13 mile north of the pipeline /cable crossing. This site is not located within the area designated Gulf Sturgeon Critical Habitat.

   Other relevant existing structures in the vicinity of the proposed project area include residential piers, bulkhead, boat slips, boat launches, and associated dredged channels located along the eastern shoreline of the mouth of Saint Louis Bay between the CSX Train Bridge and the U.S. Hwy 90 Bridge. This project will be located outside the riparian rights zone of any adjacent property owners on the eastern shore.

2. Existing Conditions:
   The proposed site is a firm mud (mixture of sand, silt and clay), tidally influenced estuarine habitat that ranges in depth from 6.6 -10 feet. Salinity and dissolved oxygen levels at the site are highly variable given its proximity within an estuarine environment. Salinity can range from 1-27 parts per thousand and dissolved oxygen can range from 3.5-10.5 mg/L depending on environmental and seasonal conditions. Current is generally low in this area, except when storms pass through, and is primarily driven by tidal flux. Large volumes of freshwater are provided to the bay via the Jourdan River to the northwest and the Wolf River to the northeast. Heavy rainfall events and increased water levels in the Jourdan and Wolf Rivers can cause drastic dips in salinity levels as well as generate a strong south current through the mouth of St. Louis Bay and across the proposed project site.

3. Sea grasses & Other Marine Vegetation:
   To date, there is no evidence, nor has there been any observance, of submerged aquatic vegetation at the proposed site.

4. Mangroves:
   There are no mangroves present in or near habitats immediately surrounding the restoration site.

5. Corals:
   There are no corals present in or near the waters surrounding the restoration site.

D) Project Description and Construction Methods

1. Project:
   MDMR is seeking several lease locations within MS waters. These leases will be sub-divided into one to five acre sections and sub-leased to individuals interested in pursuing off-bottom shellfish aquaculture businesses. MDMR intends to sponsor a shellfish aquaculture training program, which trains new aquaculturist in all aspects of operating a shellfish aquaculture business from inception through one harvest cycle. These off-bottom aquaculture leases will improve water quality in and near the sites due to the oysters filtering the water as they feed. The creation of these off-bottom aquaculture sites will also create valuable near shore habitat that will support and sustain healthy populations of estuarine fish and other invertebrates. It will also serve to decrease fishing pressure on natural oyster reefs by allowing for members of the public to invest in growing and harvesting their own oyster resources.

2. Methods: There are three off-bottom culture methods that are being considered for this training program (note: that for this site, only the floating basket system and the on-bottom basket system will be used due to the water depth being too deep for the suspended basket or longline system).

   A. Suspended basket or longline system - (see Figure1. diagram).Baskets are suspended from a tightly strung line that is clipped to posts that hold the line parallel to the bottom. Each end of the line is anchored with posts. The installation methods for these posts will vary by site and aquaculture operator, but the vibrating pile driving installation method is preferred. These lines are adjustable with numerous positions ranging from above the high tide mark to below the low tide mark. The adjustability of these lines allows the baskets to be dried to control for biofouling and to adjust in-water depths to maximize feeding and growth. The main line is constructed of PolyDac™ line or6-mm monofilament encased by an 11-mm outer poly casing (or similar strength materials), pulled taught between the posts to allow for a 20% line stretch. The estimated footprint crated by 8 runs with 560 2-in diameter PVC pipes and 16 8-inch wooden posts is 2,562. 72 in^2 (17.8 ft^2; 0.0041% of an acre).

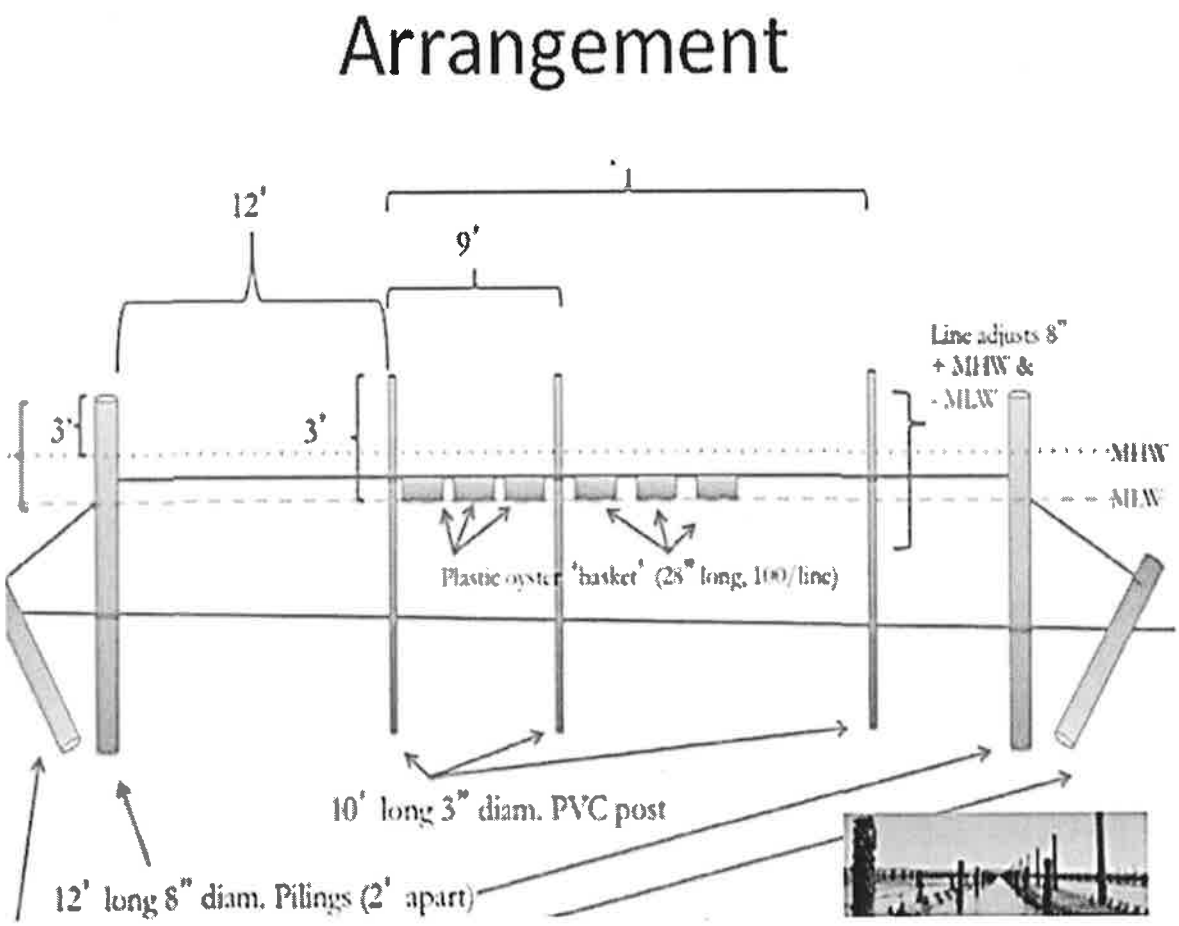


Figure 1. Diagram of a suspended basket or longline, off-bottom aquaculture design (diagram courtesy of W. Walton, Auburn University).

B. Floating basket system - (see Figure2. for description and diagram).Floating baskets are tethered together by two 150-ft lines strung in series. These lines are anchored at each end to the bottom using 5-in x 30-in screw-in tie-downs. Installation methods for the screw-in tie-downs will vary by site and aquaculture operator. The estimated bottom footprint created by 5 runs anchored by 10 screw-in anchors is 4.4 in^2 (0.31 ft2; 0.000007% of an acre). The main lines are constructed of PolyDac™ (polyester/polyethylene blend) line or 6-millimeter (mm) monofilament encased by an 11-mm outer poly casing (or similar strength materials), pulled taut (20% line stretch) between the anchors. The baskets are attached to these main lines by 3/8-inch lead line, 6-mm monofilament line encased by an 11-mm outer poly casing, or by clips 9 to 10.8mm long (or similar strength materials). The baskets then float via integrated buoys.

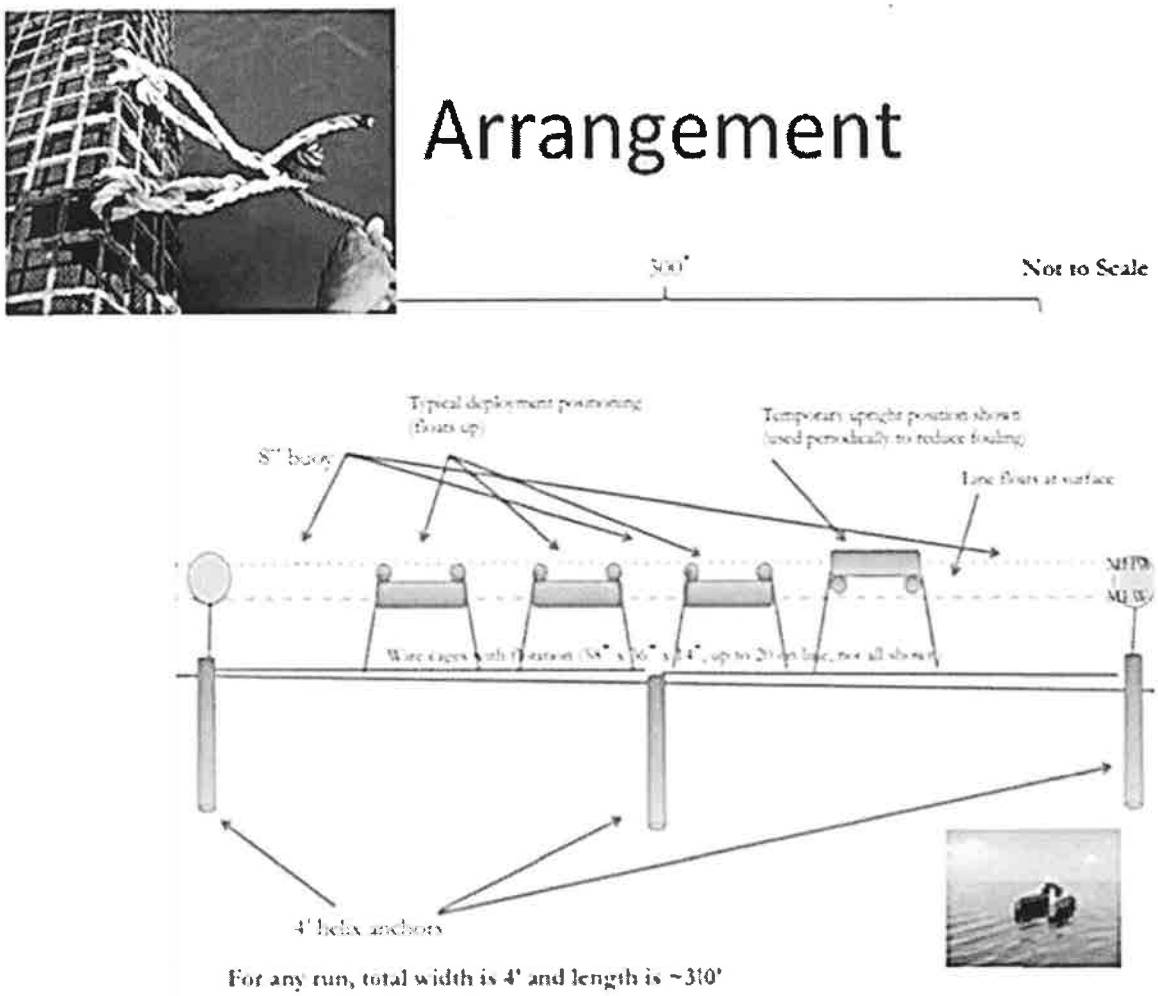


Figure 2 Diagram of a floating basket, off-bottom aquaculture design (diagram courtesy of W. Walton, Auburn University). The 3 baskets on the left are submerged in grow-out mode, while the basket on the right is emergent in desiccation mode to remove biofouling

C. Off- bottom basket system - (see Figure3. diagram) find attachment and description. There are a variety of off- bottom basket designs, but most utilize PVC-coated wire to form a rectangular container approximately 3 by 4 ft. with various heights depending on the number of levels, or "stacks," that hold oysters in stiff plastic mesh bags. The mesh size of the bag varies depending on grow-out stage of the oysters. These baskets are connected in "runs" of 40-45 that are connected to a 200-ft line that is anchored at each end. The baskets are 1 ft. off the sea bottom on legs formed from the wire. These baskets are anchored to the bottom by 8-in diameter wooden posts at each end. The installation methods of these posts will vary by site and aquaculture operator, but the preferred method of installation will be the vibrating pile driving system.

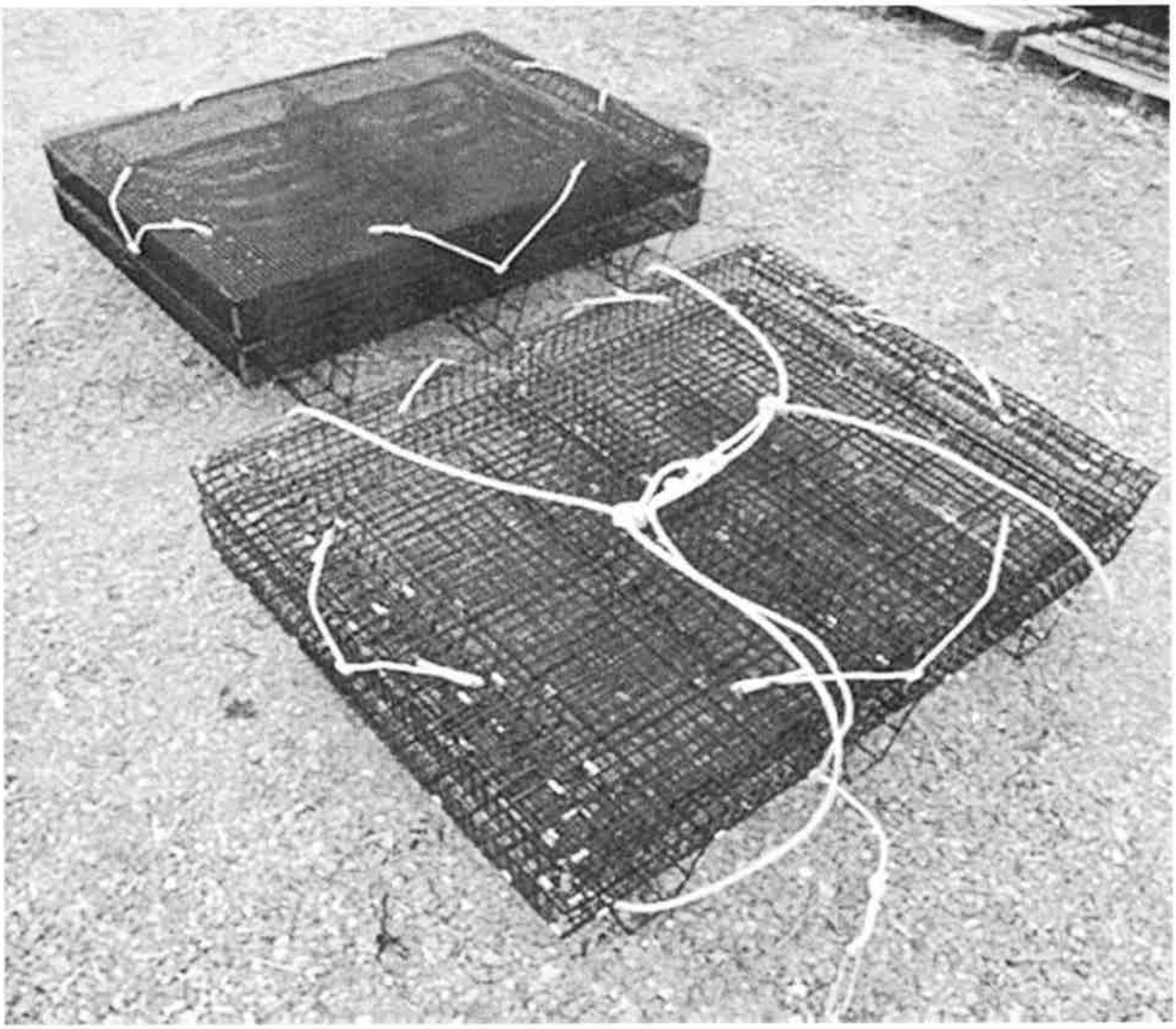


Figure 3. Example of an off-bottom basket culture system (photo courtesy of Chesapeake Bay Oyster Company)

3. Overwater Structures:
   There is no overwater structures proposed for this project.

4. Pilings& Sheetpiles:
   Pilings of the 4"-12" in size are driven using a pump that shoots a jet of water through a pipe that's sharpened on the end. The tip of the pipe is placed at the base of the piling and the jet of water and weight of the piling does all the work of installing the piling (See Figure 4 for diagram).

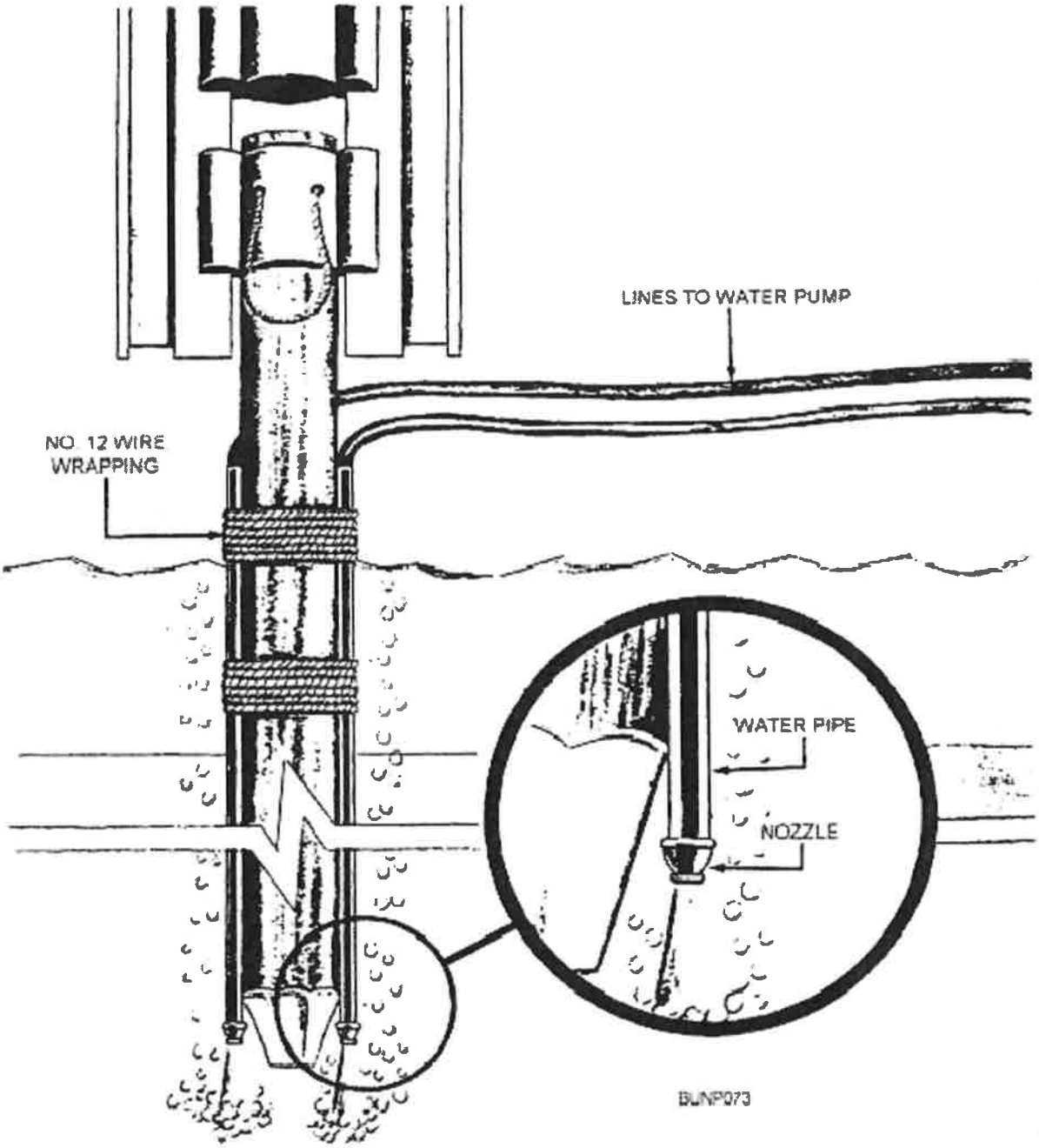


Figure 4. Example of piling installation using jet driving technique and the hydraulic technique.

Traditional pile drivers include a heavy weight placed between guides so that it is able to freely slide up and down in a single line. It is placed above a pile (pole). The weight is raised, which may involve the use of hydraulics, steam or diesel. When the weight reaches its highest point it is then released and smashes on to the pile in order to drive it into the ground (see Figure 5 for diagram).

5. Boat Slips:
   N/A

6. Boat Ramps:
   N/A

7. Shoreline armoring:
   N/A

8. Dredging:
   No dredging will be required at the site to allow barges to install pilings. Pilings will be loaded on barges in a manner so that their draft does not exceed the depth of the area they will be working in; therefore, dredging will not be necessary at any time during this project. The currently proposed off-bottom oyster aquaculture project has no foreseeable negative impacts to the environment and is <u>not</u> located in Gulf Sturgeon Critical Habitat.

9. Blasting:
   N/A

10. Artificial Reefs:
    N/A

11. Construction Schedule:
    Construction on the site depends on acquisition of necessary permits in order to begin work. MDMR would like to begin work sometime between the months of August and November of 2016 to take advantage of the peak oyster growing period that occurs during the winter months. Work would be performed only during daylight hours. Daily activities include loading of pilings on the barges and maneuvering the barges on the lease sites for installation of piling. It is anticipated that 20 pilings a day can be installed and the work will be done in stages. The current plan is for MDMR to conduct a training program that utilizes a small section of each site (2 to 10 acres). Construction on these areas will be done prior to the beginning of the program. The remaining area will be available for lease from interested oyster farmers in 1 to 5 acre parcels. These areas will be constructed in stages as they are leased and they will be designed to accommodate the aquaculture method preferred by each leaseholder.

12. Mitigation/Protective Measures:

Mitigation will be fulfilled by reducing oyster harvesting pressure on natural oyster reefs in MS waters. Additional mitigation is not likely to be necessary for any part of this project as the objective of the project is to create areas with minimum to no environmental impacts where stakeholders can utilize different aquaculture techniques to grow and harvest their own oyster resources, therefore, reducing commercial harvesting pressure on natural oyster reefs. Overall this project will improve existing environmental conditions by creating areas where oysters will grow by filtering nutrients from the local waters, which will improve water quality parameters in the vicinity of the aquaculture areas. It will also aid in creating valuable near shore habitat for marine fish and invertebrates, enhance the local economy by creating jobs, adding new seafood markets, and reduce harvesting pressure on natural oyster reefs in MS.

Two endangered fish species are known to inhabit or have historically inhabited the waters surrounding the proposed project sites, the Gulf Sturgeon and the Smalltooth Sawfish. However, this site is <u>not</u> in an area that is considered critical Gulf Sturgeon habitat. Smalltooth Sawfish historically inhabited the waters of the Gulf of Mexico from Texas to Florida; however, their current populations are known only to exist along the southernmost tip of Florida in the Gulf of Mexico and limited areas of the Atlantic Coast. However unlikely it may be to encounter these two species during the scope of this project, protective measures will be taken to avoid any negative impacts to Gulf Sturgeon and Smalltooth Sawfish present in the area. Workers and MDMR personnel will be briefed on proper procedures to observe, recognize, and notify appropriate authorities should they encounter these endangered species at the site during the scope of their daily restoration activities. All personnel will be advised that there are civil and criminal penalties for harming, harassing, or killing Smalltooth Sawfish, which are protected under the Endangered Species Act of 1973.

Additionally, several species of sea turtles are known to inhabit the Gulf of Mexico and Mississippi Sound. These species include the Green Turtle, Hawksbill Turtle, Kemp's Ridley Turtle, Leatherback Turtle, and Loggerhead Turtle; all of which are listed as endangered. To prevent turtles from becoming entangled when oyster are farmed, ropes and lines associated with off-bottom oyster aquaculture will be pulled taught to secure the gear properly and safely. Floating cages and baskets used to house juvenile oysters in the aquaculture facility will use mesh sizes no larger than one inch in order to prevent turtles from entering or having appendages caught inside the equipment. In order to avoid unforeseen negative impacts to sea turtles,

personnel will be: 1) instructed of the potential presence of these species and the need to avoid collision with them at the project site; 2) advised that there are civil and criminal penalties for harming, harassing, or killing of these species covered under the Endangered Species Act of 1973; 3) notified that all vessels associated with the construction project shall operate at "no wake/idle" speeds at all times while in the construction area and while in water depths where the draft of the vessel provides less than a four-foot clearance from the bottom. All vessels will preferentially follow deep-water routes (e.g., marked channels) whenever possible; 4) instructed that if a sea turtle is seen within 100 yards of the active daily construction/dredging operation or vessel movement, all appropriate precautions shall be implemented to ensure its protection. These precautions shall include cessation of operation of any moving equipment closer than 50 feet of a sea turtle. Operation of any mechanical construction equipment shall cease immediately if a sea turtle or is seen within a 50-ft radius of the equipment. Activities may not resume until the protected species has departed the project area of its own volition. And, 5) alerted that any collision with and/or injury to a sea turtle shall be reported immediately to the National Marine Fisheries Service's Protected Resources Division (727-824-5312) and the local authorized sea turtle stranding/rescue organization. Implementation of these specific criteria and plan of action at the project site will prevent any negative effects to sea turtles.

E) Effects of the Project

1. Listed Species and Critical Habitat within the Action Area:
   This proposed site is <u>not</u> located within the boundary of the area listed as Gulf Sturgeon Critical Habitat, but is in the range of several listed species, including Gulf Sturgeon, Smalltooth Sawfish, Green, Hawksbill, Kemp's Ridley, Loggerhead, and Leatherback Turtles.

   Once the aquaculture sites become operational, it is likely oystermen will be working at the site on a routine basis during daylight hours. Smalltooth Sawfish are cartilaginous fishes that inhabit the shallow muddy and sandy bottom environments located in and around the coastal bays and estuaries of the US. Their range previously stretched across the northern Gulf of Mexico from Texas all the way to the southern tip of Florida, and extended north to Cape Hatteras, NC. However, during the past century they have experienced extensive habitat loss and overfishing causing their range to be drastically diminished. The only currently known populations of Smalltooth Sawfish in the US are isolated to the peninsula of Florida and the coastal environments around the Everglades. Considering this available

information provided by extensive research on this species, it is highly unlikely the project will have any negative impacts on Smalltooth Sawfish or that workers will encounter them during the scope of daily activities associated with this project.

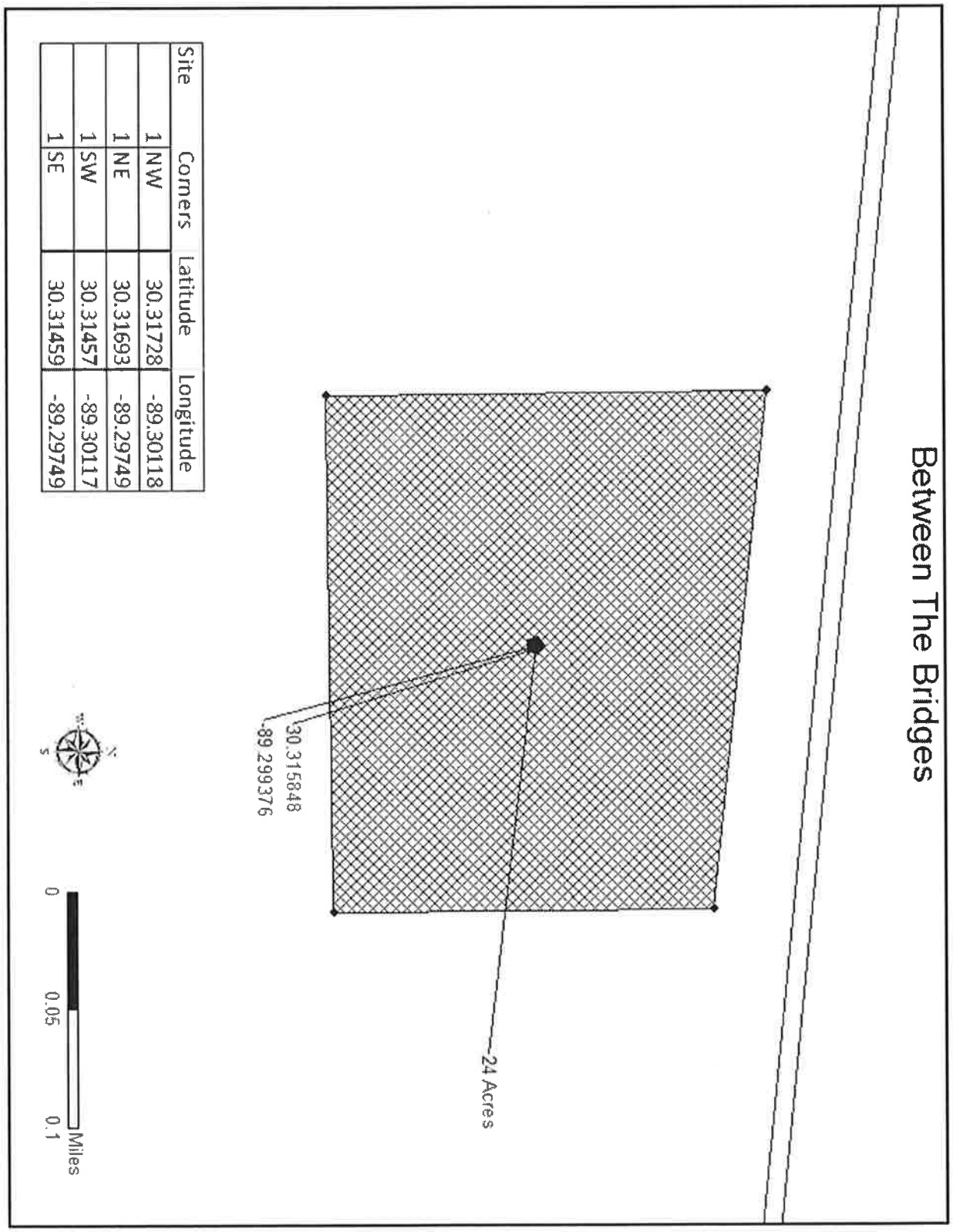
The ranges of five of the listed sea turtle species do encompass the Mississippi Sound. Special attention will be given to prevent any negative impacts to those species occurring in the proposed project vicinity. Trained personnel will always be present during the execution of this project and workers aboard all vessels will be briefed on all special conditions provided in the permit regarding sea turtles and any other listed species. Implementation of "protected species construction conditions," acquired through NMFS official web page, will ensure that no sea turtles will be negatively impacted or affected during this project.

2. Effects to Species:
   It is unlikely there will be any adverse effects to any of the listed species within the boundary of the proposed project sites.

3. Effects to Critical Habitat:
   The proposed aquaculture site is located north of the CSX Train Bridge, which is not designated as Gulf Sturgeon Critical Habitat; therefore, no effects will result from construction or operation of an oyster aquaculture system at its location.

   Considering the proposed site is <u>not</u> located within Gulf Sturgeon Critical Habitat, and that the water depth at the site is too deep to do the suspended basket or longline system which uses the most pilings per acre, it is unlikely that there will be any negative effects to critical habitat of other listed species as a result of the construction or operation.

Attachment



Site	Corners	Latitude	Longitude
1	NW	30.31728	-89.30118
1	NE	30.31693	-89.29749
1	SW	30.31457	-89.30117
1	SE	30.31459	-89.29749

ENHANCE • PROTECT • CONSERVE

Mississippi Dept of Marine Resources
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APR 06 2016
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Environmental Assessment

OFF-BOTTOM AQUACULTURE SITE IN MISSISSIPPI SOUND
LOCATION: BETWEEN THE BRIDGES IN SAINT LOUIS BAY
DATE: APRIL 5, 2016

Mississippi Department of Marine Resources
EXECUTIVE OFFICE | 1141 BAYVIEW AVE., BILOXI, MS 39530

1. Project Background

In February 2015, Governor Phil Bryant issued an Executive Order, creating the Governor's Oyster Restoration and Resiliency Council. This Council was charged with developing a report for oyster resource creation and management while considering environmental and economic factors and influences. The Oyster Council was comprised of representatives from groups and organizations such as, oyster tongers, dredgers, processors, State government, Federal government, restaurant/hospitality, finance, marketing, research, non-profit, and environmental. The Council was made up of three committees: Oyster in the Economy, Oysters in the Environment, and Aquaculture and Emerging Technologies. Each committee had a clear, defined but separate scope, and each operated independently. They met often, to prevent duplication of effort, and shared ideas in order to come up with a set of integrated recommendations to help improve each aspect of oysters in Mississippi. Council members explored and evaluated best practices and programs adopted by Mississippi, our neighbor states in the Gulf, and other major oyster harvesting communities around the country in order to develop a bold, implementable report to grow Mississippi's oyster population. Once the final report was completed and submitted, the Governor offered his full attention and support to move forward with the recommendations set forth by the Council.

In the final report, the committee for Aquaculture and Emerging Technologies identified three priority areas where efforts and resources should be focused, one of which was to facilitate the successful implementation of off-bottom commercial oyster farming operations in Mississippi waters. With this in mind, MDMR has developed a plan to apply this recommendation and move forward with developing a program to begin off-bottom oyster farming/aquaculture in the State of Mississippi.

2. Project Description

The proposed project is to create an area to be utilized for off-bottom oyster farming/aquaculture between the US 90 Bridge and the CXS Train Bridge, in Saint Louis Bay (See Figure-1 diagram). The project site is placed in a manner so as not to obstruct access to the bay and to prevent conflicts with other user groups that may be using Saint Louis Bay for other allowable activities. The dimensions of the proposed area are 1161 feet in length and 985 feet in width, totaling 24 acres. Within the boundary of the site, approximately 40 pilings with up to an 8-inch diameter will be placed per acre in order to accommodate different off-bottom oyster farming techniques. The techniques being considered are the Suspended Basket, Floating Basket, and Off-Bottom Basket systems. MDMR intends to sub-divide the project area into sections and sub-lease to individuals interested in pursuing off-bottom shellfish aquaculture businesses. Each individual operator will be allowed to determine which of the three techniques they would like to apply for the sub-leased area they are working within.

Using the Suspended Basket or Long-Line technique, baskets are suspended from a tightly strung line that is clipped to posts that hold the line parallel to the bottom. Each end of the line is anchored with posts. The installation methods for these posts will vary by site and aquaculture operator, but the vibrating pile driving installation method is preferred.

These lines are adjustable with numerous positions ranging from above the high tide mark to below the low tide mark. The adjustability of these lines allows the baskets to be dried to control for biofouling and to adjust in-water depths to maximize feeding and growth. The main line is constructed of PolyDac™ line or 6-mm monofilament encased by an 11-mm outer poly casing (or similar strength materials), pulled taught between the posts to allow for a 20% line stretch. The estimated footprint created by 8 runs with 560 2-in diameter PVC pipes and 16 8-inch wooden posts is 2,562.72 in^2 (17.8 ft^2; 0.0041% of an acre). (See Figure-2 diagram)

Operators that choose to use the Floating Basket system will apply a different technique, in which floating baskets are tethered together by two 150-ft lines strung in series. These lines are anchored at each end to the bottom using 5-in x 30-in screw-in tie-downs or by using 8-inch wooden pilings on each end of the row. Installation methods for the screw-in tie-downs will vary by site and aquaculture operator. Pilings may also be used on each end to anchor the floating baskets. The estimated bottom footprint created by 5 runs anchored by 10 screw-in anchors is 4.4 in^2 (0.31 ft2; 0.000007% of an acre). The main lines are constructed of PolyDac™ (polyester/polyethylene blend) line or 6-millimeter (mm) monofilament encased by an 11-mm outer poly casing (or similar strength materials), pulled taut (20% line stretch) between the anchors. The baskets are attached to these main lines by 3/8-inch lead line, 6-mm monofilament line encased by an 11-mm outer poly casing, or by clips 9 to 10.8mm long (or similar strength materials). The baskets then float via integrated buoys. (See Figure-3 diagram)

There are a variety of off- bottom basket designs, but most utilize PVC-coated wire to form a rectangular container approximately 3 by 4 ft. with various heights depending on the number of levels, or "stacks," that hold oysters in stiff plastic mesh bags. The mesh size of the bag varies depending on grow-out stage of the oysters. These baskets are connected in "runs" of 40-45 that are connected to a 200-ft line that is anchored at each end. The baskets are 1 ft. off the sea bottom on legs formed from the wire. These baskets are anchored to the bottom by 8-inch wooden pilings at each end. The installation methods of these posts will vary by site and aquaculture operator, but the preferred method of installation will be the vibrating pile driving system. (See Figure-4 diagram)

Pilings may be used as the supporting structure for all three of the considered techniques. These pilings will be no greater than 8-inches in diameter and are either driven using a pump that shoots a jet of water through a pipe that's sharpened on the end or vibrated down through the substrate while pressure is applied to the top. Because of the additional strength provided by vibrating the pilings into place, this is the preferred method; however, both methods of pile driving will be considered depending on the substrate type and what methods are allowable according to regulatory agencies.

Construction on the site depends on acquisition of necessary permits in order to begin work. MDMR would like to begin work sometime between the months of August and November of 2016 to take advantage of the peak oyster growing period that occurs during

the winter months. Work would be performed only during daylight hours. Daily activities include loading of pilings on the barges and maneuvering the barges on the lease sites for installation of piling. It is anticipated that 20 pilings a day can be installed and the work will be done in stages. The current plan is for MDMR to conduct a training program that utilizes a small section of each site (2 to 10 acres). Construction on these areas will be done prior to the beginning of the program. The remaining area will be available for lease from interested oyster farmers in 1 to 5 acre parcels. These areas will be constructed in stages as they are leased and they will be designed to accommodate the aquaculture method preferred by each leaseholder.

3. Purpose and Need for the Project

Worldwide oyster reefs are in decline, with estimates suggesting as much as 85% of historic oyster reefs have been lost across the globe (Beck et al. 2011). A multitude of natural and anthropogenic factors have played a role in this decline, including overfishing, habitat destruction, disease, and pollution.

Oyster reefs in Mississippi are no exception to this decline. Just over ten years ago (in 2004), over 400,000 sacks of oysters were harvested from Mississippi waters during a relatively normal season. Since then, the resource has endured devastating events such as, Hurricane Katrina (2005), the BP Oil Spill (2010), and the Bonnet Carré Spillway opening (2011). The 2013-2014 MS Oyster Season yielded about 70,000 sacks of oysters harvested by the oyster fishermen. The following year, the 2014-2015 MS Oyster Season, as predicted, was an even less productive year with only 26,000 sacks of oysters being harvested. Large data sets collected by State marine biologists continue to indicate that the oyster population in MS is still declining. In fact, for the past two years industry representatives and MDMR biologists debated if Mississippi should open the oyster harvesting season at all. Currently, four months into the normal harvesting season, oyster fishermen have harvested only 28,255 sacks of oysters as part of the 2015-2016 MS Oyster Season.

Despite the significant decline in oyster populations in MS waters, the MS Sound and its associated bays and bayous continue to show they are healthy and capable of producing enough seafood to sustain an industry. Recent oyster reef restoration projects have shown healthy recruitment of spat and continued monitoring efforts have indicated survival and growth rates are representative of a healthy, sustaining oyster resource. Future projects are currently being developed to restore many of the historic oyster reefs that have experienced some of the sharpest adverse effects caused by recent disasters. Restoration of these reefs is very important and having healthy oyster reefs is vital to the estuarine ecosystems in Mississippi. Some of the benefits provided to the local ecosystems by oyster reefs include, improved water quality, increase of fish and invertebrate habitat, sediment stabilization, decrease eutrophication, increase biomass of marine organisms and secondary production. Overall, these benefits help to create a healthy fishery and a healthy environment.

Keeping in mind the value of restoring and sustaining healthy oyster populations in MS, the Governor's Oyster Council established the goal for Mississippi to produce 1 million sacks of

oysters a year by 2025, using various methods. The Council's recommendations will serve as a guide to a long-term oyster resource management plan and program, based on implementing policies to increase, enhance, and promote the State's oyster resources. One of the principle recommendations of the Council is to develop a sector of the seafood industry based on the production of oysters through aquaculture and farming. By creating areas for local fishermen and investors to produce their own oysters for the market, a significant harvesting pressure will be taken off of the State's naturally occurring oyster reefs, allowing them the opportunity to be more healthy and self-sustaining. This will also create an opportunity for fishermen to become invested in producing their own oyster resources to promote their livelihood and the fishery.

This project will also allow the State to operate an off-bottom oyster aquaculture training program that allows members of the public who are interested in oyster aquaculture to utilize available resources to acquire knowledge on how to successfully culture their own oysters. Relieving the burden of start-up costs and gaining knowledge on how to be successful in the practice of aquaculture will facilitate stake-holder buy-in and provide more opportunities for individuals to establish their own commercial oyster aquaculture facilities in the future.

MDMR realizes that many other states are successfully culturing oysters utilizing off-bottom oyster farming techniques; however, this has not yet been done in our state. As part of this program, MDMR hopes to partner with researchers and members of the public to investigate innovative techniques, equipment, and methods that enhance the efficiency and success of culturing oysters in MS waters.

Achieving these goals would help the state to increase the quality of its coastal ecosystems, and allow fishermen to become invested in new innovative ways to produce oysters for the seafood market while relieving fishing pressure from the State's natural oyster reefs.

4. Description and Comparison of Alternatives

MDMR is seeking several lease locations within MS waters (See Figures-5 and -6. Maps for areas considered). MDMR intends to sponsor a shellfish aquaculture training program, which trains new oyster farmers in all aspects of operating a shellfish aquaculture business from inception through one harvest cycle.

A section of each lease site will be set aside for training and the remainder of the lease sites will be sub-divided into one to five acre sections and sub-leased to individuals interested in pursuing off-bottom shellfish aquaculture businesses.

Factors Considered When Selecting Sites

Because oysters are sessile and have very specific habitat and water quality requirements that are based on numerous environmental conditions and because off-bottom oyster aquaculture operations require specific physical requirements the following factors, as well as, issues that may conflict with other user groups were consider when sites were selected:

- Salinity - range generally in 6-35 ppt. is acceptable, 10-28 ppt. is considered ideal
- Water depth – 3 -5.5 ft. to accommodate wading to tend the gear for the suspended basket or long-line method (this depth range is also acceptable for the other aquaculture methods being considered)
- Sediment type – Firm enough to support wading activities for the suspended basket or long-line method
- Acreage – sufficient to accommodate a training area and additional acreage to be subleased to oyster farmers
- Shellfish Growing Area Classification – sufficient to allow for direct harvest for consumption
- Storm resiliency – protection from winds and waves
- Security - Ideally the area can be visually monitored from the mainland
- Riparian rights concerns – in MS littoral rights extend 750 yards waterward from adjacent shoreline properties

- Endangered species concerns – Gulf Sturgeon, Smalltooth Sawfish, Piping Plover, and all 5 species of Sea Turtles found in the Gulf of Mexico were considered
- Submerged Aquatic Vegetation concerns - present or not present
- Navigation concerns – is area near navigation channels or high boat traffic areas
- User group conflicts – which user groups are likely to be affected (includes aesthetics)
- Archive and History concerns – is area near cultural or historic sites
- Potential for future restoration or site for beneficial use of dredge materials
- Pipeline, fiber optics, utility crossing zones - present or not present
- Distance from shore and boat ramps – Ideally the sites are located near points of entry for ease of access
- Locate sites in the eastern and western parts of the MS Sound, so that travel cost to the sites are not cost prohibitive for oyster farmers regardless of where they live in South MS.

The three methods of off-bottom aquaculture being considered for implementation at the sites are the suspended basket or long-line off-bottom aquaculture system, floating basket off-bottom aquaculture system and off-bottom basket culture system. One important point that was considered is that oyster farmers generally handle the gear for the suspended basket or long-line method of off-bottom aquaculture by getting into the water and walking on the bottom next to the gear, so the bottom must be firm enough to support their weight. Also, to accommodate this method of off-bottom aquaculture, the water depths considered for the majority of the sites are primarily in 3 ft. to 5.5 ft. range, which could be expected to yield adequate water depths for wading at some time during most tidal cycles. These water depths of 3 to 5.5 ft. are also suitable for the other two methods of off-bottom aquaculture being considered. Except for the site, that is located between the bridges in Bay St. Louis, which is too deep to accommodate the suspended basket or long-line aquaculture system, all of the other sites can accommodate all of the aquaculture methods being considered. Being able to use as many aquaculture methods as possible in a site will provide

some efficiency to the training program by eliminate excessive travel between sites for the training personnel.

An important factor that was considered when sites were reviewed was to locate each site in an area where oysters could be harvested and sold for direct consumption. Mississippi is a member of the Interstate Shellfish Sanitation Conference and follows the National Shellfish Sanitation Program (NSSP) guidelines to properly classify all of the shellfish growing area waters of the State (Figure-7, current classification map of the waters of the Mississippi Sound). The only areas that were considered were areas that are currently classified as Approved, Conditionally Approved or the proposed classification is under review and meets the requirements to be upwardly classified (to Approved or Conditionally Approved and the MDMR staff is actively working on these new classifications in accordance with NSSP guidelines).
The primary NSSP classifications that are used in Mississippi are:

I. Approved –These areas can be open to direct harvest and consumption without regard to rainfall or river stage concerns (except in extreme weather events or manmade disasters).
II. Conditionally Approved - These areas can be opened for direct harvest and consumption as long as conditions in the approved management plan are not exceeded (usually rainfall amounts or river stage levels).
III. Restricted – These areas cannot be opened to direct harvest or consumption but relay activities may be allowed.
IV. Prohibited- These areas cannot be open to direct harvest or consumption.
V. Unclassified- These areas cannot be open to direct harvest or consumption. These areas may be considered for reclassification to one of the above classifications provided that all of the standards of the National Shellfish Sanitation Program are met.

In this round of permit applications only areas that were adjacent to publically held lands were considered. The rational considered for only looking in these areas was dealing with private land owners for use of riparian rights leases would be time consuming and add an estimated six to nine months to the permitting process and would be difficult with the requirements State agencies must meet in the current State financial and legal systems. Routine contracts currently take between 90 and 120 days. A contract like this one that involves a long term lease and three different sets of attorneys (MDMR's, MS Secretary of State and the private land owners) would likely take substantially longer. In addition, it is assumed that the legal matters associated with this type of lease are considered to be workable, but challenging and add considerable cost. MDMR currently has short term funding to initiate off-bottom aquaculture, but long term stable funding to pay for long term lease fees, which may be required, with private land owners is not currently secured. Lastly, there is some level of uncertainty when dealing with private land owners. The State of Alabama's Off-bottom Oyster Aquaculture Training Program was unsuccessful in having their riparian rights lease renewed for their initial training site which has caused some unexpected challenges for their program.

After this round of permits are filed, MDMR intends to explore working through the problems mentioned above to see if working with interested private land owners that have land adjacent to suitable areas is feasible (Mississippi Law Code 49-15-9 allows land owner 750 yards from their shore lines to plant, cultivate and gather oysters).

Sites Being Considered

A. *Between the Bridges in Saint Louis Bay*

The primary factors used in selecting this site are the area provides some protection from wind and waves by the shoreline of Saint Louis Bay, it is not located in an area considered as critical Gulf Sturgeon Critical Habitat, and the area is accessible for people interested in off-bottom aquaculture that reside in the central and western section of coastal Mississippi.

Positive Factors:

- Good security – can be seen from the mainland.
- The area considered is outside of the riparian rights zone of 750 yards from the shoreline.
- Water depths are too deep to consider suspended basket or long-line method of off-bottom aquaculture but should be an ideal area for the off-bottom basket culture system and the floating basket method.
- Sediment type – firm mud which can support the weight of the off-bottom basket culture system.
- The area is close to public boat ramps.
- Storm resiliency – some protection from wind and waves from the shoreline of the Bay St. Louis.
- This sites current NSSP Classification is Conditionally Approved and managed with 1 inch of rainfall and 10 ft. river stage for the Pearl River at Pearl River Gauge.
- This site is close to the area of the Mississippi Sound that produces the majority of the State's oyster production and it is anticipated that oysters would survive and grow well.
- The area is **not** in critical Gulf Sturgeon Critical Habitat.

Negative Factors:

- Navigation concerns – the area is used by all types of boaters and is near a navigation channel (approximate 1100 ft. buffer between the west side of the site and the navigation channel).
- The area has a pipeline and fiber optics crossing zone approximately 500 feet south of the southern boundary of this lease site.
- The site is only 24 acres due to limiting factors on all sides (the U.S. Hwy 90 Bridge is on the north side, the eastern side is just outside the 750 yard riparian rights zone, there is an approximate 500 ft. buffer for the pipeline crossing on the south side and there is an approximate 1100 ft. buffer between the west side of the site and the navigation channel).

- The area has an unknown bottom obstruction noted on the navigational chart inside the boundaries of this proposed site.
- User group conflicts – recreational fishermen and recreational crabbers are known to use this area.
- Concerns about aesthetics from private property owners along the eastern shore of Saint Louis Bay that are between the US Hwy 90 Bridge and the CSX Train Bridge.

B. *Henderson Point*

The primary reasons for selecting this site are that the bottom types and water depths are suitable to accommodate all off-bottom oyster aquaculture methods being consider and the area is accessible for people interested in off-bottom aquaculture that reside in the central and western section of coastal Mississippi.

Positive Factors:

- Good security – can be seen from the mainland.
- The area can accommodate a large lease site with enough acreage for the initial training program.
- Bottom type and water depths could accommodate wading associated with the suspended basket or lone-line method of off-bottom aquaculture.
- The area is close to public boat ramps.
- Storm resiliency – the area is protected from northerly winds by the mainland and is exposed to southerly winds (it is expected that aquaculture gear in this area would be exposed to moderate wear and tear, mostly from line chaffing).
- This site's current NSSP Classification is Conditionally Approved and managed by 1 inch of rainfall and 10 ft. river stage for the Pearl River at Pearl River Gauge.
- This site is close to the area of the Mississippi Sound that produces the majority of the State's oyster production and it is anticipate that oysters would survive and grow well.
- This area is accessible for people interested in off-bottom aquaculture that live in the central and western section of coastal Mississippi.

Negative Factors:

- Endangered species concerns – the area is considered critical habitat for Gulf Sturgeon and adjacent to a sand beach that could potentially be used for sea turtle nesting.
- Potential navigation concerns – the area is used by recreational fishermen and boaters (including kayaks, jet skis and canoes) and commercial crabbers.
- User group conflicts –includes recreational fishermen and crabbers and people that use the Harrison County Sand Beach for swimming, wind surfing, and bird watching.
- Concerns about aesthetics from adjacent property owners and people using the Harrison County Sand Beach.

C. *South Deer Island (south of USACE borrow pit)*

The primary reasons for selecting this site are that the bottom types and water depths are suitable to accommodate all off-bottom oyster aquaculture methods being considered, the area is accessible for people interested in off-bottom aquaculture that reside in the central and eastern sections of coastal Mississippi and Katrina Key provides protection from southerly winds. The available buffer of 1500 ft. between this proposed off-bottom oyster aquaculture site and the existing artificial reef site (Katrina Key) was deemed to be sufficient for safe navigation for vessels using the area.

Positive Factors:

- The area can accommodate a large lease site with enough acreage for the oyster aquaculture training program.
- The bottom type and water depths could accommodate wading associated with the suspended basket or long-line method of off-bottom aquaculture.
- The area is fairly close to public boat ramps.
- Storm resiliency - Katrina Key which is a large key built with the Biloxi/Ocean Spring Hwy 90 Bridge that was destroyed in Hurricane Katrina and is located approximately 1500 ft. south of the site and provides some protection from southerly winds and waves (this would help to protect the aquaculture gear from some wear and tear).
- This site is currently listed as unclassified, but has been reviewed by the MDMR Shellfish Bureau and meets the requirements for the NSSP's Approved classification. The MDMR Shellfish Bureau is currently in the process of upwardly classifying this area.
- This area is accessible for people interested in off-bottom aquaculture that reside in the central and eastern section of coastal Mississippi.

Negative Factors:

- Poor security - the area cannot be seen from the mainland.
- Endangered species concerns – the area is considered critical habitat for Gulf Sturgeon and adjacent to a sand beach that could potentially be used for sea turtle nesting.
- Potential navigation concerns with recreational fishermen (boats, kayaks, jet skis and canoes) and commercial crabbers and shrimpers.
- User group conflicts – recreational fishermen, birders, crabbers and shrimper all are known to use this area at times.
- Archives and History issues - a cultural resource survey may be required.
- Concerns about aesthetics from people that use the south side of Deer Island.

<u>Sites Considered, But Rejected</u>

D. *South Deer Island (north of USACE borrow pit)*

This site is just north of the Deer Island site listed above. All of the factors that are listed in the site analysis for the South Deer Island (south of USACE borrow pit) site were considered and the conclusions were the similar. The primary difference is that the

northern site was north of a channel that was dredged to restore the south and west sides of Deer Island. When the shape file was provided to MDMR for the area that was permitted by the US Army Corp of Engineers for a borrow pit, it was determined that the remaining area outside of the USACE permitted area was too narrow for an off-bottom aquaculture lease site; therefore, this site was rejected.

E. *Cat Island (Little Bay)*

The primary reasons for selecting this site are the area is protected from wind and waves on all sides, and bottom types and water depths are suitable to accommodate all off-bottom oyster aquaculture methods being considered. Also, a local business is already interested in doing off-bottom oyster aquaculture in this area.

Positive Factors:

- The bottom type and water depths could accommodate wading associated with the suspended basket or lone-line method of off-bottom aquaculture.
- Storm resiliency – the site is inside Little Bay which is on the south side of Cat Island and is protected from all directions from wind and waves.
- This site is currently listed as unclassified, but has been reviewed by the MDMR Shellfish Bureau and meets the requirements for the NSSP's Approved Classification. The MDMR Shellfish Bureau is currently in the process of upwardly classifying this area.
- MDMR has already received a request from a local business that is interested in doing off-bottom oyster aquaculture in this area.
- The land immediately adjacent to the site is a marsh edge and does not appear to be good nestling habitat for sea turtles or Piping Plover.
- This general area was previously used for off-bottom oyster aquaculture in the 1990's.

Negative Factors:

- Endangered species concerns – the area is considered critical habitat for Gulf Sturgeon.
- Potential navigation concerns – the area is used by recreational boaters and fishermen (including kayaks, jet skis and canoes) and birders.
- User group conflicts – recreational fishermen, birders and vessels seeking safe harbor.
- Archives and History issues - a cultural resource survey may be required.
- The area is not close to any public boat ramps, which makes crossing the Mississippi Sound to Cat Island a dangerous task at times, especially with boats loaded with oysters and gear. Accessing this site will most likely not occur as safely and as often as near shore sites that are more easily accessible.
- While initial field surveys did not indicate that any submerged aquatic vegetation is in the area near the site. The area is listed on NOAA's SAV Habitat Map and will require a submerged aquatic vegetation survey, which will be done between June and August of 2016.

F. *North Deer Island*

Heavy use by recreational boaters and both commercial and recreational shrimp fishermen are the primary reason for rejecting this site. This area is open for a substantial part of the year to recreational and commercial shrimping and live bait shrimping. If a shrimper or live baiter mistakenly pulled their trawls into the off-bottom oyster aquaculture site it could cause substantial damage to the vessel, aquaculture site and the gear. Also, potential navigation concerns were an issue with this site because this area is heavily traveled and used by recreational boaters and fishermen.

Positive Factors:

- Good security – can be seen from the mainland.
- The area can accommodate a large lease site with enough acreage for the oyster aquaculture training program.
- The area is close to public boat ramps.
- Storm resiliency - Deer Island would provide protection from southerly winds and waves.
- Bottom type and water depths could accommodate wading associated with the suspended basket or long-line method of off-bottom aquaculture (this area did not have a field survey done to confirm these factors).
- This site is currently listed as unclassified, but has been reviewed by the MDMR Shellfish Bureau and meets the requirements for the NSSP's Conditionally Approved classification. The MDMR Shellfish Bureau is currently in the process of upwardly classifying this area to Conditionally Approved.

Negative Factors:

- Endangered species concerns – the area is considered critical habitat for Gulf Sturgeon and adjacent to a sand beach that could potentially be used for sea turtle nesting.
- Potential navigation concerns - the area is heavily utilized by recreational boaters (boats, kayaks, jet skis and canoes) and recreational and commercial fishermen (crabbers and shrimpers).
- User group conflicts – the area is heavily used by recreational fishermen, birders, campers, crabbers, live baiters shrimpers and both commercial and recreation shrimpers. Additionally, this area is routinely opened for live bait, commercial and recreational shrimping when shrimp meet the legal size requirements.
- Archives and History issues –would a cultural resource survey be required.
- The area is close to an area that MDMR Shellfish Bureau would like to open in the future for direct oyster harvest for tongers.
- This site may conflict with future planned restoration activities.
- Concerns about aesthetics from people that use the north side of Deer Island.

G. *Pass Christian Near Menge Avenue*

Being in between two existing artificial reefs (Lang Avenue Reef and Japonica Drive Reef) and concerns about safe navigation were the primary reasons for rejecting this site. The available buffer of 400 ft. between this proposed off-bottom oyster aquaculture site and both of the existing near shore artificial reef sites was deemed to be too small of a buffer for safe navigation of vessels using the artificial reef sites.

Positive Factors:

- Good security – can be seen from the mainland.
- The area is close to public boat ramps.
- Storm resiliency – the area is protected from northerly winds by the mainland and is exposed to southerly winds (it is expect that aquaculture gear in this area would be exposed to moderate wear and tear, mostly from line chaffing).
- Bottom type and water depths could accommodate wading associated with the suspended basket or long-line method of off-bottom aquaculture (this area did not receive a field survey to confirm these factors).
- This site's current NSSP Classification is Conditionally Approved and managed with 1 inch of rainfall and 10 ft. river stage for the Pearl River at Pearl gauge.

Negative factors:

- Endangered species concerns – the area is considered critical habitat for Gulf Sturgeon and adjacent to a sand beach that could potentially be used for sea turtle nesting.
- The area cannot accommodate a large lease site with enough acreage for the aquaculture training program
- Potential navigation concerns - with recreational fishermen, the area is very close to and between two artificial reef sites (Lang Avenue Reef and Japonica Drive Reef).
- User group conflicts – Recreational fishermen, birders and crabbers are known to use this area.
- Concerns about aesthetics from adjacent property owners and people using the Harrison County Sand Beach.

5. Description of the Affected Environment

Saint Louis Bay is a partially enclosed shallow water estuary located in the western section of the Mississippi Sound and is affected greatly by currents in the MS Sound and flows from the Wolf and Jourdan Rivers. This estuary receives freshwater input directly from two rivers the Jourdan River which empties into the northwestern section of the bay and the Wolf River which empties into the northeastern section of the bay. Generally, higher saline waters enter the bay from the Mississippi Sound which is located immediately south of the bay. This bay system is made up of subtidal estuarine habitat near shore, with pine-oak maritime woodland inland, and sea grass beds and mollusc reef in the intertidal, subtidal and off shore zones. It also boasts coastal marshes and several small bayous. The bay is approximate 5.6 miles in width measuring from east to west and approximately 4.7 miles in length measuring from southern most point at the mouth of the bay to the northern shore.

This unique bay has many different marine and terrestrial habitat types. Some of the terrestrial communities along its shoreline are oligohaline or mesohaline marsh, and pine-oak maritime woodland. Marine and subtidal habitats include Mississippi Sound-sand bottom, mud flat bottom, tidal pass, sea grass beds and shellfish reef.

Fauna commonly found to inhabit the bay and the land around it include, raccoons, alligators, osprey, black skimmers, brown pelicans, white pelicans, cormorants, as well as several species of heron and gull. The bay provides excellent feeding, nesting, and wintering habitat for a variety of migratory bird species. Several species listed as rare, threatened or endangered inhabit or have been observed utilizing habitats along the bay, including, American Alligator, Bald Eagle, Brown Pelican, Bay Skipper, Mottled Duck, Black Rail, Yellow Rail, Scarlet King Snake, Gulf Salt Marsh Snake, Mississippi Diamondback Terrapin and some species of sea turtles.

Many of the rare, threatened or endangered species listed above rely mainly on the terrestrial coastal ecosystems for survival. These species include, American Alligator, Bald eagle, Bay Skipper, Mottled Duck, Black Rail, Yellow Rail, Scarlet King Snake, Gulf Salt Marsh Snake. Because this restoration project focuses entirely on subtidal oyster reefs, no negative effects to coastal ecosystems above the mean low water level are anticipated.

Some of the more common flora along the bay are slash pine, live oak, palmetto, black needle rush, smooth cordgrass, gulf cordgrass, salt-meadow grass, eelgrass, duck potato and common reed. One species of threatened or endangered plant has been observed near the bay, Southern Red Cedar.

Topography of the land adjacent to the bay is similar to the other bays located in the Mississippi. The lowest elevations are in the subtidal habitats and average -1 foot below sea level, while the highest elevations are found along the bluff that runs along the Waveland, MS shore near the mouth of the bay measuring approximately 15 feet above sea level.

The shoreline along the southern half of the bay is developed with residences, businesses, piers, bulkheads, boat ramps and marinas.
There are two bridges that cross the bay and connect the cities of Pass Christian and Bay St Louis. The US Hwy 90 Bridge that is an elevated four lane highway that was constructed to replace the old US Hwy 90 Bridge that was destroyed during Hurricane Katrina. The other bridge is the CSX Train Bridge. It is an elevated concrete bridge that runs parallel to the US Hwy 90 Bridge. The train bridge is approximately .68 miles to the south of the US Hwy 90 Bridge.
Between the bridges is a submerged cable/pipeline crossing that runs along the sea floor parallel to bridges and is approximately .34 miles south of the US Hwy 90 Bridge and .34 miles north of the CSX Train Bridge.

The area of the bay that is being proposed for oyster farming/aquaculture is a sand/clay/silt mixed bottom, tidally influenced estuarine habitat that ranges in depth from 6.6 to 10 feet. Salinity and dissolved oxygen levels at the site are highly variable given its proximity within

an estuarine environment. Salinity averages 14 parts per thousand and can range from 1-27 parts per thousand. Dissolved oxygen can range from 3.5-10.5 mg/L depending on environmental and seasonal conditions. Current is generally low inside the bay, except when storms pass through, and is primarily driven by tidal flux.

There is no evidence, nor has there been any observance, of submerged aquatic vegetation within the boundaries of the proposed site. No submerged aquatic vegetation been has identified in the vicinity of the proposed area. Shall sea grasses be discovered, the appropriate measures and project adjustments will be made to avoid negatively impacting these sensitive areas.

6. **Project Impacts**

How the proposed project and associated activities will affect the local environment and the organisms that depend on the environment, in the area being proposed is very important to the review of this project. Considerations of direct and indirect effects are taken into account and measures to avoid and reduce adverse effects are recommended for each of the following affected areas. Analyzing the characteristics of each aspect of the environment and the habitats utilized by marine species allows managers to predict what type of overall effects and impacts may occur as a result of the proposed project.

Land use

Saint Louis Bay is shallow water partially enclosed estuary located in the western section of the MS Sound. The shoreline along the southern half of the bay is developed with residences, businesses, piers, bulkheads, boat ramps and marinas.
There is a diverse community of user groups that share the bay and what it has to offer. Recreation seekers typically use the public areas in the southwestern portion of the bay for sun bathing, swimming, flounder gigging, cast netting, wade fishing as well as fishing from the bank and at public piers. The southeastern portion of the bay can also be used for many of the activities mentioned above, however most of the land in this section of the bay is privately owned.

The proposed project will be confined to subtidal areas in the Saint Louis Bay, between the US Hwy 90 Bridge and the CSX Train Bridge and is not foreseen to have any effect on upland areas of the bay.

Water Bottom

The water bottom within the boundary of the proposed off-bottom aquaculture site has a firm texture and consists mainly of sand, silt and clay. This data was collected during field investigations during which transects were sampled across the entirety of the site using a hollow PVC pipe to sample the bottom. Along each transect, and at regular intervals, the PVC pipe was used to penetrate the bottom sediment to determine sediment type, depth, and condition of firmness. One of the most important criteria used in selecting this site is that the bottom substrate is firm enough to support the weight of the Off-bottom Basket System. Inside the project boundary a series of rows will be laid out, with pilings on either end of each row in order to anchor the aquaculture equipment. Pilings measuring 8 inches

in diameter will be placed at a density no greater than 40 pilings per acre, which will amount to a total footprint of less than 0.032% of the total area of the site. The total area impacted by placement of pilings over the 24-acre site would be 0.0076 acres, roughly smaller than the size of a two-car garage.

As a result, there will be impacts to the water bottoms within the proposed project site due to the placement of pilings. These impacts will be minimal, effecting approximately 0.032% of the total area of the site. Fish and other invertebrates will maintain the ability to utilize the area between the pilings and may also benefit by seeking shelter within the system of pilings and foraging on invertebrates that colonize the vertical surface of the pilings. Considering the impacts to the water bottoms from the US 90 Bridge, the CSX Train Bridge and the Pipeline/cable crossing, the impact of this project will be insignificant. Therefore, no significant adverse effects are expected from the proposed project.

Hydrology

Saint Louis Bay is a coastal watershed located in southern Mississippi, which is composed of two basins: Jourdan River Basin and the Wolf River Basin. Depths in the area of the bay where the proposed site is located range from 6.6 – 10 feet. Hydrology in the bay is influenced primarily by tidal flux. Occasionally, periods of heavy rain north of the coast can cause high water flow in the nearby Jourdan and Wolf Rivers, which may lead to an increase in predominant currents and allow freshets from the north and west to move into the bay and surrounding areas for short periods of time.

Generally the Mississippi Sound provides higher saline water to the bay. However, both the Pearl River which is a major drainage basin for a large section of the State and the Bonnie Carre' Spillway which is a flood control system on the Lower Mississippi River can lower salinities of the waters entering the bay from the Sound during major flood events.

Within the 24-acre proposed Saint Louis Bay site small changes to hydrology can be expected, such as water flowing around structures and small eddies resulting from currents moving across pilings and aquaculture gear. These fractional changes in hydrology dynamics are not expected to cause any significant impacts and may serve to benefit local marine species by creating pockets of refuge and habitat for them to hide. Although small alteration to hydrology dynamics may be expected around pilings and gear, no significant adverse effects to the overall hydrology of the area are expected from the proposed project. Considering the impacts to the hydrology from the US Hwy 90 Bridge and the CSX Train Bridge, the impact of this project to hydrology will be minimal.

Water Quality

It is common knowledge that healthy oysters filter large volumes or water in the course of a day. One adult oyster can effectively filter up to 50 gallons, or 190 Liters, of water in a day, which can offer many direct and indirect benefits to the local marine ecosystem. Oysters feed by filtering large amounts of phytoplankton, microbes, and suspended solids from the water column, thus, improving water clarity in nearby waters. Oysters also have the ability to increase denitrification processes that assist in decreased levels of nutrient loading. It has

been documented in many instances that significant decreases to natural oyster populations within estuaries coincided with increased nutrient loading during the same time interval, which, can lead to hypoxia (Dame et al. 1989). Because the proposed site is in the more restricted mouth of Saint Louis Bay, where the currents are swifter than in the two adjacent water bodies, it is anticipated that the water filtration services provided by the oysters from this aquaculture project may have a significant affect to water quality in the area.

While pilings are being placed during the construction phase of the proposed project, turbidity will be temporarily increased. Best management practices will be utilized during this phase and turbidity screens may be placed to minimize impacts to the surrounding environment.

No pollutants will be generated as a result of the proposed project. Water quality in the area of the proposed project will likely experience an increase in filtration services and a decrease in levels of nutrient loading, which may prevent hypoxic conditions from developing. Overall, no adverse effects to water quality are expected to result from this project.

Sediment Supply

Sediments to Saint Louis Bay are supplied from the two rivers that drain into the bay (Jourdan River and Wolf River) and from sediment deposited in the bay during major storm events such as Hurricanes Camille and Katrina. Analysis of surface sediments from Saint Louis Bay reveals significant input of sand from the Wolf and Jourdan Rivers, and evidence of deposits of silts and clays within the northeast and northwest parts of the bay, caused by flocculation from the saltwater wedge entering the bay and interacting with fine-grained sediment input from these rivers. The mouth of the bay has a region of high-silt surface sediments that extends northward into the bay. The sand in the bay is from two sources, river sand (angular shaped) deposited by the Wolf and the Jourdan Rivers and beach sand (round shaped) deposited by major storm events.

Except for minor turbidity from the installation of pilings during the initial construction phase of the site, there will be no additional adverse effects to sediment supply as a result of the proposed project.

Temperature Regimes

The temperature regimes of the waters in and around the bay are consistent with the natural changes in the environment. During the summer months these waters can warm to as much as 31 degrees Celsius, while reaching as low as 5 degrees Celsius during the winter months. Depending on depth and distance from the surface water-air interface, the temperature can vary drastically. Waters within 1 to 2 feet from the surface water-air interface can change as much as ± 5 degrees Celsius per day with major influences coming from radiative heating and cooling related directly to exposure to sunlight. Deeper waters experience less day-to-day temperature variation and typically change relative to the more

broad weather patterns and seasonal changes. Bottom temperatures usually vary less than ± 1 degree Celsius per day depending on total depth.

The placement of pilings and equipment associated with oyster aquaculture will not have any influence on natural temperature regimes in the waters surrounding the proposed site. No adverse effects to local water temperatures are anticipated to result from the proposed project.

Salinity

Because of its location adjacent to the estuarine waters of the MS Sound, and due to the fresh water inflows from the Wolf and the Jordan Rivers, salinity within the bay varies greatly depending on the season, currents, and amount of local and regional rainfall. Average salinity at the site is 14 parts per thousand, but the salinity typically ranges from 5 to 25 parts per thousand. During times of prolonged drought, however, higher salinity waters from the open ocean may push landward and influence the bays ecosystems. Salinities have been measured upwards of 27 parts per thousand when this has happened in the past. On the other hand, when large amounts of rain fall within the drainage basins that affect coastal waters, salinities can be seen in the bay as low as 1 parts per thousand. Such large ranges in salinity readings are indicative of the estuarine areas of the MS Sound.

The placement of pilings and equipment associated with oyster aquaculture will not have any influence on salinity regimes in the waters surrounding the proposed site. No adverse effects to salinity are anticipated to result from the proposed project.

Currents

Currents can be relatively strong in the waters of Saint Louis Bay near the proposed aquaculture site, which is in the mouth of the bay and is narrower than the main body of the of the bay to the north and the Mississippi Sound to the south. As mentioned previously, Saint Louis Bay receives fresh water input from two tributaries, the Jourdan River on the northwestern side of the bay and the Wolf River on the northeastern side of the bay. Stronger currents are produce when large amounts of rain fall within the drainage basins of these two river systems. Also, currents along the shoreline can be driven by tidal flux depending on the lunar cycle and season. Average tidal range measures between +2 feet mean sea level to -2 feet mean sea level depending on the time of year and direction of prevailing winds.

Placement of pilings and equipment associated with the oyster aquaculture facility may create a slight resistance to tidal currents ebb and flow; however, the distance between pilings and equipment is such as to not significantly impede the natural flow of water across the site. There will be no significant adverse effects to currents within Saint Louis Bay as a result of the proposed project. Considering the impacts to the natural currents cause by the US Hwy 90 Bridge and the CSX Train Bridge, the impact of this project will be minimal.

Biological Productivity

The biological productivity of coastal wetlands in the Saint Louis Bay is greater than many coastal areas. This is demonstrated by the various wildlife species that inhabit the bay and the waters in and around the bay.

The waters around the bay are also very productive. Several oyster beds are located around the perimeter of the bay, which offer great nursery habitat for juvenile fishes and invertebrates native to the estuary. Recreational and commercial anglers enjoy the abundance of fish that the bay waters produce.

By creating an oyster aquaculture facility, it is expected the bay's production will further be enhanced. Modern oyster aquaculture methods that are being proposed will take advantage of the middle of the water column to produce high concentrations of oysters in baskets or cages. Waters that would otherwise only be frequented by pelagic fish species or traversed by a few invertebrates would be developed into highly productive waters with potential to yield hundreds of thousands of market sized oysters. These oysters and their baskets/cages will also serve as refuge and foraging areas for the aforementioned organisms. Utilization of off-bottom oyster aquaculture facilities for foraging and refuge by recreationally and commercially important fish and invertebrates has been observed in Louisiana and Alabama, and can be expected on the proposed site.

Biological productivity will be enhanced with the implementation of the proposed project and no negative effects are anticipated.

Estuarine Fish, Essential Fish Habitat

Oyster reefs are known to provide valuable habitat for a variety of marine species. They create a habitat of hard substrate with an abundance of interstitial spaces creating refuge and foraging opportunities for many finfish and crustacean species that are native to estuarine ecosystems. They offer habitat for improved recruitment of small and juvenile fish and crustaceans, as well as provide a base for increased survivorship. Research has proven that overall biomass of fish and large mobile crustaceans increases exponentially with the addition or restoration of oyster reef habitat in estuarine ecosystems (Peterson et al. 2015)

The addition of oyster reef habitat will only serve to enhance estuarine fish communities and essential fish habitat by providing new habitat and increased potential for recruitment and survivorship of native marine species. No adverse effects will result from the proposed project.

Species of Concern

Several species that are considered species of concern may be found inhabiting or temporarily utilizing the marine habitats around the project site. These species include: Mississippi Diamondback Terrapin, Smalltooth Sawfish, Kemp's Ridley sea turtle, and Loggerhead sea turtle.

Gulf Sturgeon

This site is north of the CSX Train Bridge in Saint Louis Bay and outside of the area designated as critical Gulf Sturgeon habitat.

Mississippi Diamondback Terrapin

Diamondback Terrapin turtles are commonly found in the brackish coastal waters of the Mississippi Sound and its many islands, bays, and bayous. These habitats include salt marshes, lagoons, swamps, tidal creeks, and mangrove thickets. Although they spend most of their time in the brackish environment, access to fresh water sources is vital to their health.

Their preferred nesting habitat may range from "pocket" beach habitats just a few yards long to extensive areas of beach hundreds of yards long. Beach nesting sites are typically not far from marshy or other vegetated areas, which provide shade and shelter to turtles. Diamondback Terrapins exhibit a preference for soft mud bottom habitats as opposed to sand and firm bottom types, which may also coincide with the habitat preferred by their prey.

Foraging habitat for this species is typically salt marsh habitats and their associated bays and tidal creeks. Adults of this species primarily consume periwinkles, small bivalves, mollusks, and small crustaceans such as fiddler crabs and small blue crabs. Juveniles spend much of their time in the high marsh habitats further landward, where they forage on small crustaceans, mollusks, and insects.

Major threats to Mississippi Diamondback Terrapin include nest predation by small mammals and incidental catch in trawls and crab traps. Much of the habitat utilized by the terrapins is highly productive shrimp, crab, and oyster habitat. Many fishermen set crab traps along the bays and bayous that support high numbers of terrapin populations, which results in incidental catch and subsequent drowning when turtles are caught. To prevent this occurrence, Mississippi has implemented a program to install turtle excluder devices on crab traps that are frequently set in terrapin habitat to allow them to escape if incidentally caught.

This proposed site in Saint Louis Bay is near known terrapin habitat. Much of the brackish water coastal habitat utilized by terrapin is also native to oysters. Fortunately, the area being proposed for this off-bottom aquaculture site is in deeper water (the depth at the site ranges from 6.6 to 10 ft.) which would require them to be a considerable distance from near shore marsh and tidal habitats preferred by terrapin. It can be reasonably expected that terrapin will avoid any temporary disturbance caused by site construction. To prevent turtles from becoming entangled when oyster are farmed, ropes and lines associated with off-bottom oyster aquaculture will be pulled taught to secure the gear properly and safely. Floating cages and baskets used to house juvenile oysters in the aquaculture facility will use mesh sizes no larger than one inch in order to prevent turtles from entering or having appendages caught inside the equipment. Also, terrapin seem to exhibit a preference for soft mud bottom. The water bottom within the boundary of this proposed off-bottom

aquaculture site has a firm texture and consists mainly of sand, silt and clay. Considering these factors, it is unlikely that off-bottom oyster aquaculture activities will cause any adverse effects to Mississippi Diamondback Terrapins or their near shore habitat. Any and all appropriate measure will also be taken to avoid any additional or unforeseen impacts.

Smalltooth Sawfish

Historic data shows that the range of Smalltooth Sawfish extended through the Gulf of Mexico from Florida to Louisiana, which included the MS Sound. To date, the only evidence of this species in the Gulf of Mexico is limited to the southwest region of Florida. The reduction in the historical range of this species is most likely a result of heavy trawling activities for shrimp and other commercially important marine species throughout coastal waters of the northern Gulf of Mexico. There has been no indication that Smalltooth Sawfish are still present in Mississippi waters.

The proposed project will have no effect on Smalltooth Sawfish or the area designated as Critical Habitat for this species.

Sea Turtles

Some species of Threatened or Endangered sea turtles are known to inhabit the coastal waters of Mississippi, including the areas around Saint Louis Bay. Listed sea turtles that may occasionally occur within the project area are Loggerhead and Kemp's Ridley sea turtles.

Loggerhead sea turtles inhabit a range of different marine habitats, ranging from open ocean to shallow bays, bayous, and marshes. They are bottom feeders and are commonly observed preying on sea urchins, starfish, crabs, shrimp and other crustaceans. Almost all of their population can be found on the east and west coasts of Florida, but on rare occasions they can be found in the western Gulf of Mexico and even in Mississippi waters. The vast majority of Loggerhead sea turtle nesting areas are located in Florida; however, the Chandeleur Islands of Louisiana are home to the largest nesting area in the western Gulf of Mexico. Nests have been found on the Mississippi mainland and Mississippi barrier islands, predominantly Horn and Petit Bois Islands with a lesser occurrence on noted on East Ship, West Ship, and Cat Islands. Nesting sites can be characterized by smooth sloping sandy beach and sand beach dune habitats typical to the barrier islands of Mississippi.

Kemp's ridley turtles are very common in the northern parts of the Gulf of Mexico. These turtles spend most of their time in the warm coastal waters of the Gulf during the summer months before they move further offshore during the winter to avoid rapidly cooling shallow coastal waters. Kemp's ridley turtles nest primarily in the Mexican state of Tamaulipas and on Padre Island in Texas. To date, no known nesting sites have been identified in MS waters; however, the possibility of them nesting along the barrier islands and beaches cannot be ruled out.

Although sea turtle nesting does occur in Mississippi waters, the proposed project site is located subtidally adjacent to shoreline that is comprised of a public boat launch and

residential developments that have a mix of bulkheads, rip rap and sand beach along the shoreline.

Submerged oyster reefs near the proposed site may attract sea turtles seeking refuge and foraging opportunities, which may cause some sea turtles to encounter or come into contact with the aquaculture site. To prevent sea turtles from becoming entangled, ropes and lines associated with off-bottom oyster aquaculture will be pulled taught to secure the gear properly and safely. Floating cages and baskets used to house juvenile oysters in the aquaculture facility will use mesh sizes no larger than one inch in order to prevent sea turtles from entering or having appendages caught inside the equipment. Workers will be properly informed and trained on how to react in the unlikely event a sea turtle does encounter the aquaculture site. The sites location below the mean water line and away from sand beach areas will not cause any disruption to sea turtle nesting and entanglements are not likely to occur given the nature of the gear used for aquaculture production. As part of this analysis we must consider the possibility of negatively impacting sea turtles; however, with the appropriate measures being taken to ensure that gear is properly installed to prevent their harm and ensure they retain access to nesting areas, it is not anticipated that this project will have any significant adverse effects to sea turtles.

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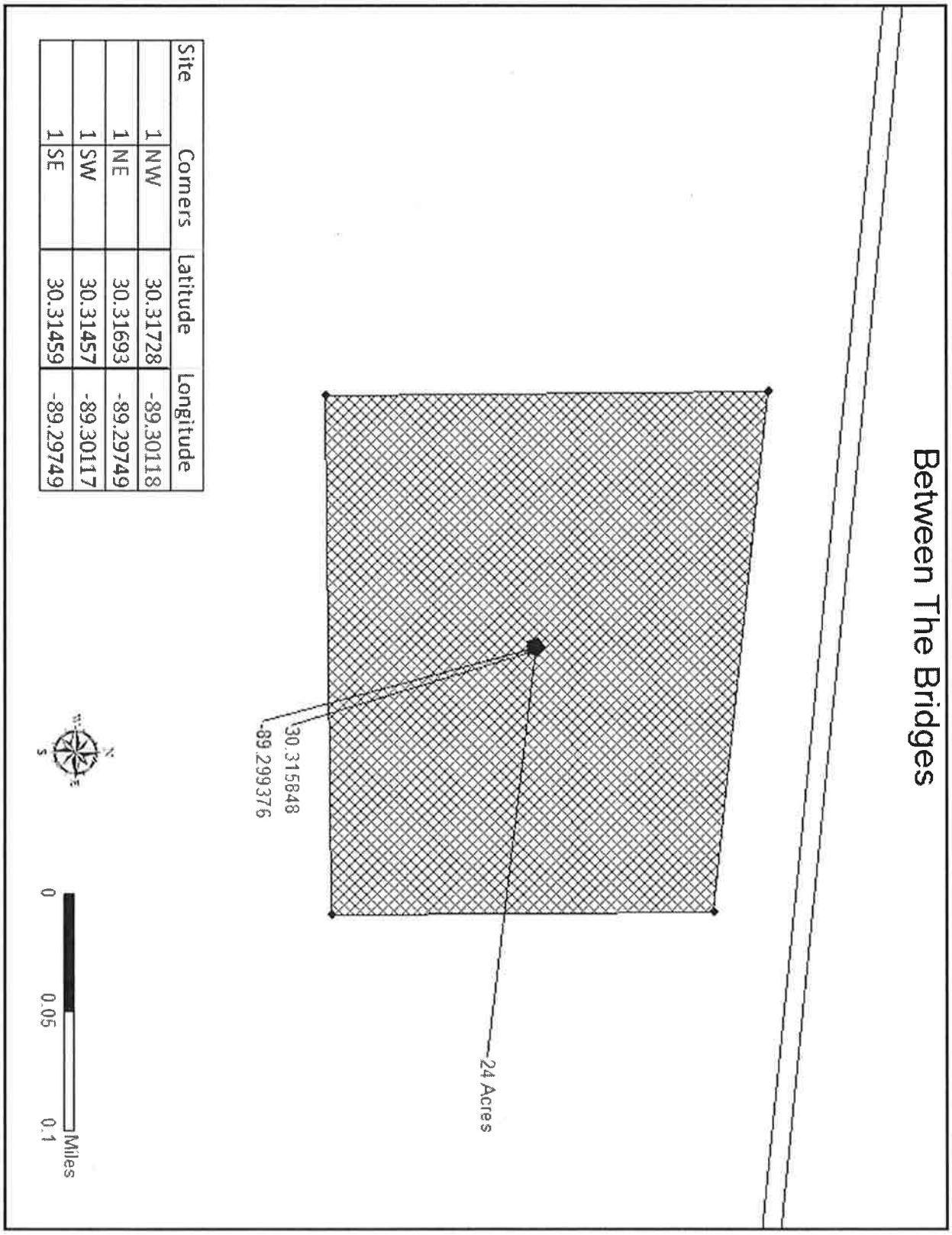
Dame RF, Spurrier JD, Wolaver TG (1989) Carbon, nitrogen and phosphorus processing by an oyster reef. Mar Ecol Prog Ser 54: 249-256

Peterson CH, Grabowski JK, Powers SP (2003) Estimated enhancement of fish production resulting from restoring oyster reef habitat: quantitative valuation. Mar Ecol Prog Ser 264:249-264



Site	Corners	Latitude	Longitude
1	NW	30.31728	-89.30118
1	NE	30.31693	-89.29749
1	SW	30.31457	-89.30117
1	SE	30.31459	-89.29749

Figure-1. Map the Between the Bridges Site in Saint Louis Bay.

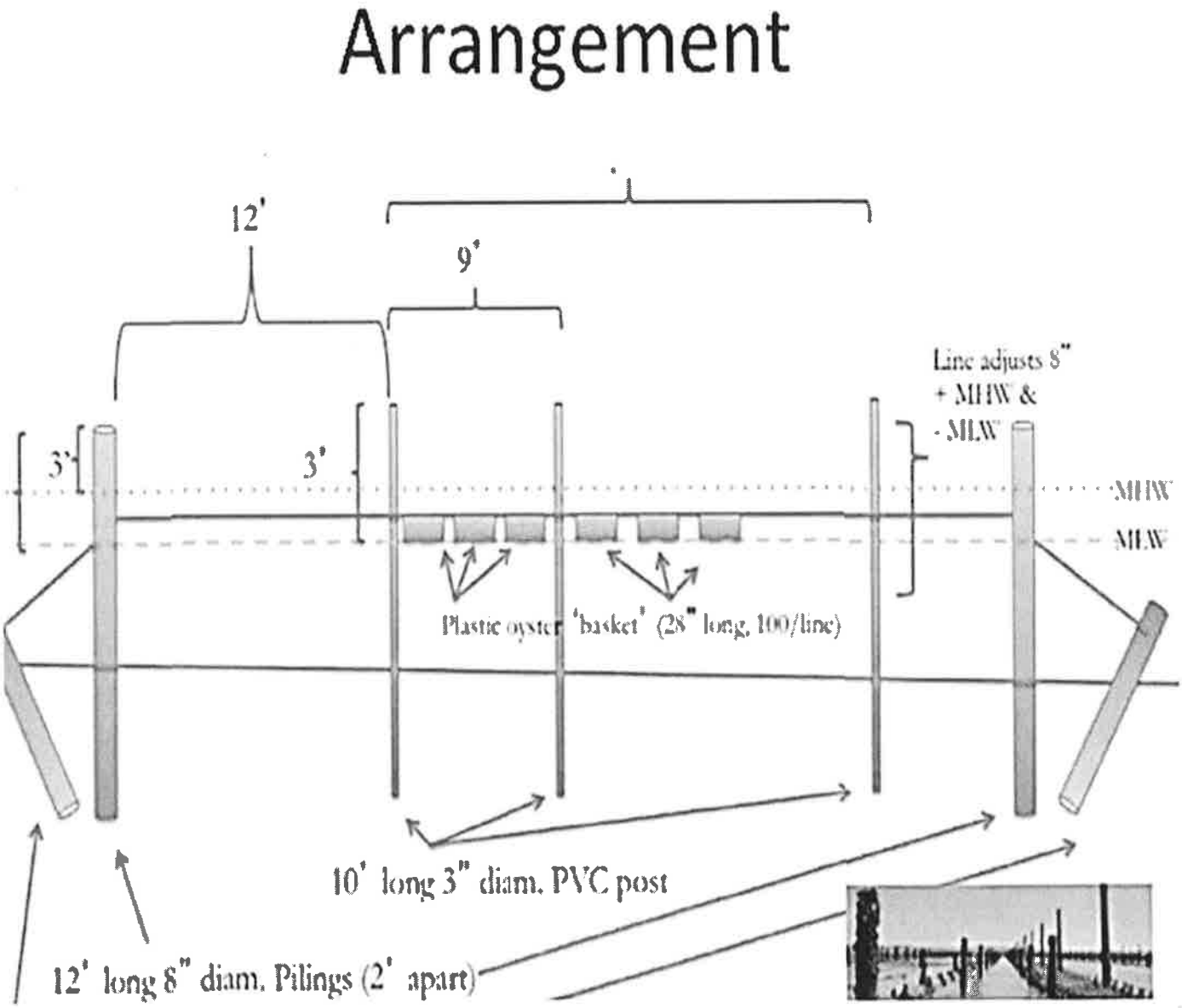


Figure-2. Diagram of a suspended basket or longline, off-bottom aquaculture design (diagram courtesy of W. Walton, Auburn University).

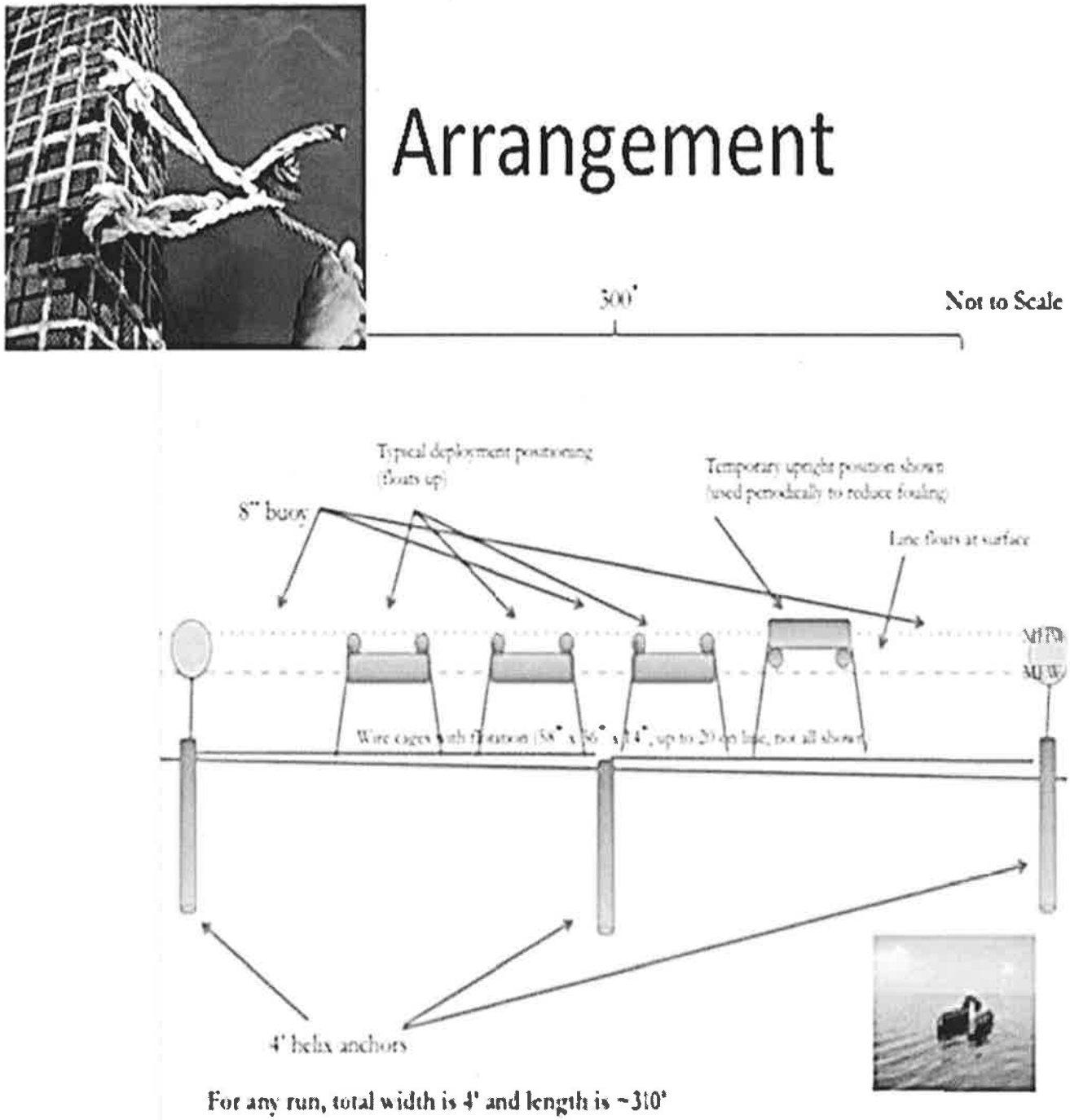


Figure-3. Diagram of a floating basket, off-bottom aquaculture design (diagram courtesy of W. Walton, Auburn University). The 3 baskets on the left are submerged in grow-out mode, while the basket on the right is emergent in desiccation mode to remove biofouling

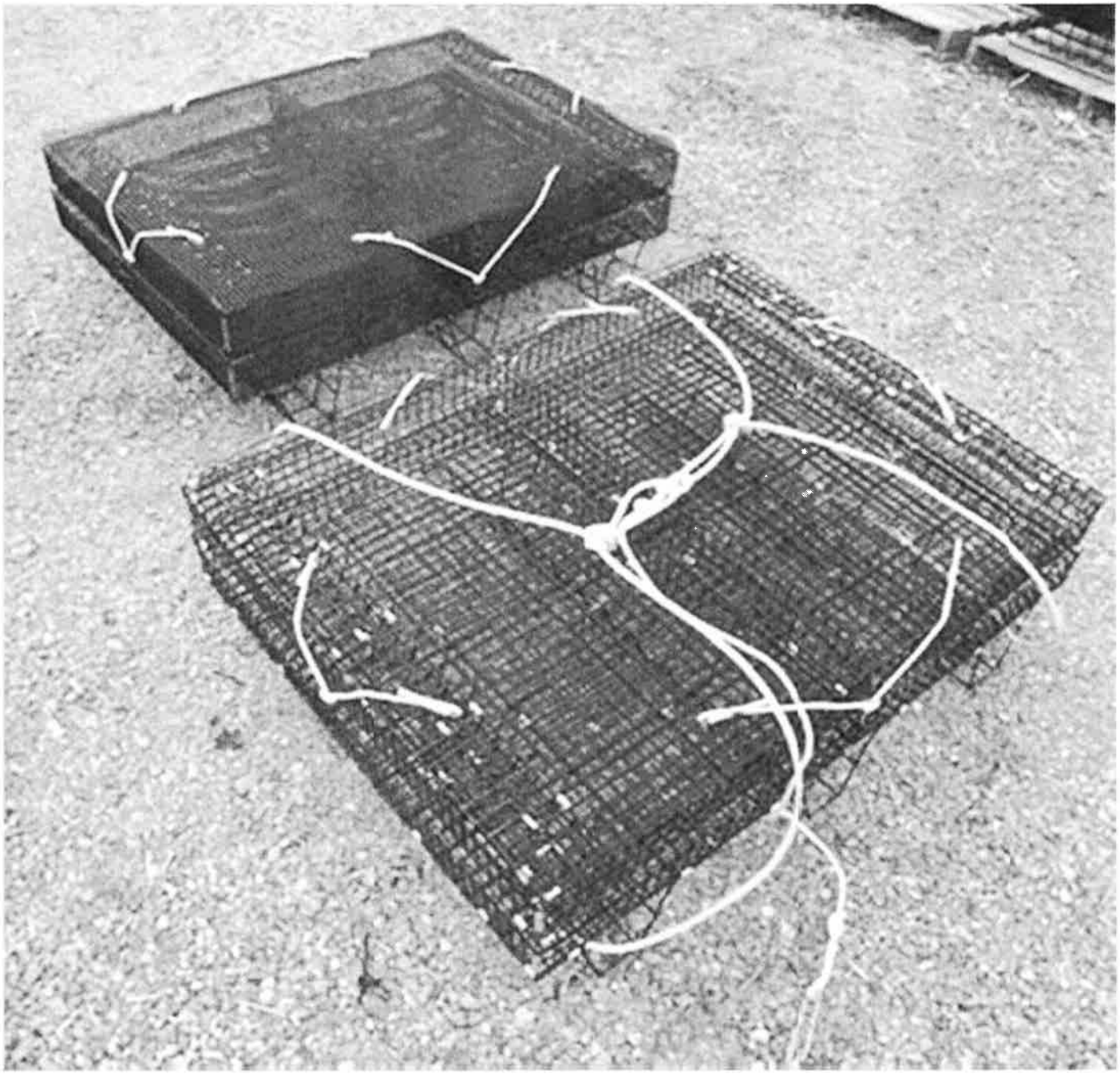


Figure-4. Example of an off-bottom basket culture system (photo courtesy of Chesapeake Bay Oyster Company)

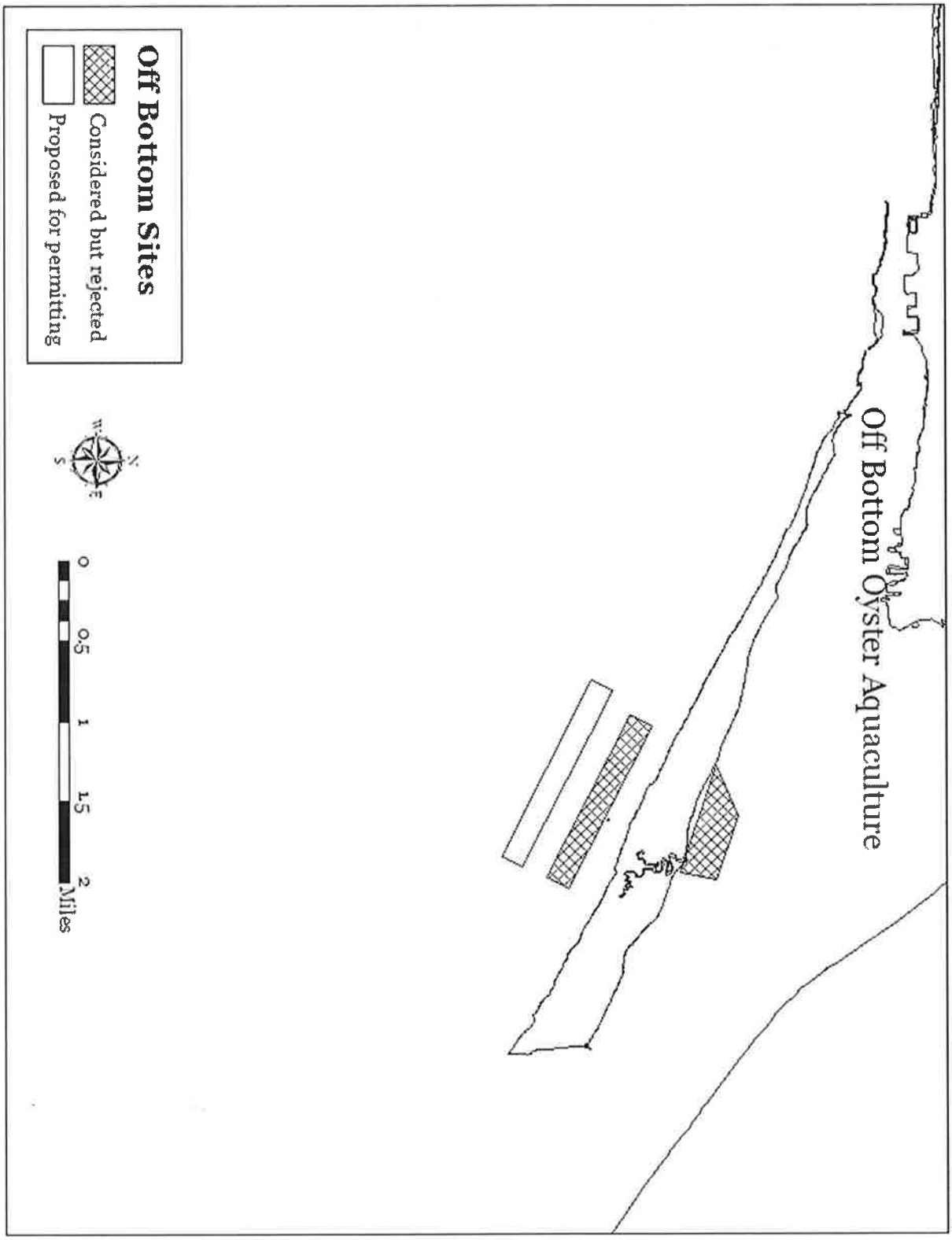


Figure-5. Off-bottom oyster aquaculture sites north and south of Deer Island that were considered by MDMR. Sites pictured are North Deer Island, South Deer Island (north of USACE borrow pit), and South Deer Island (south of USACE borrow pit) (top to bottom)

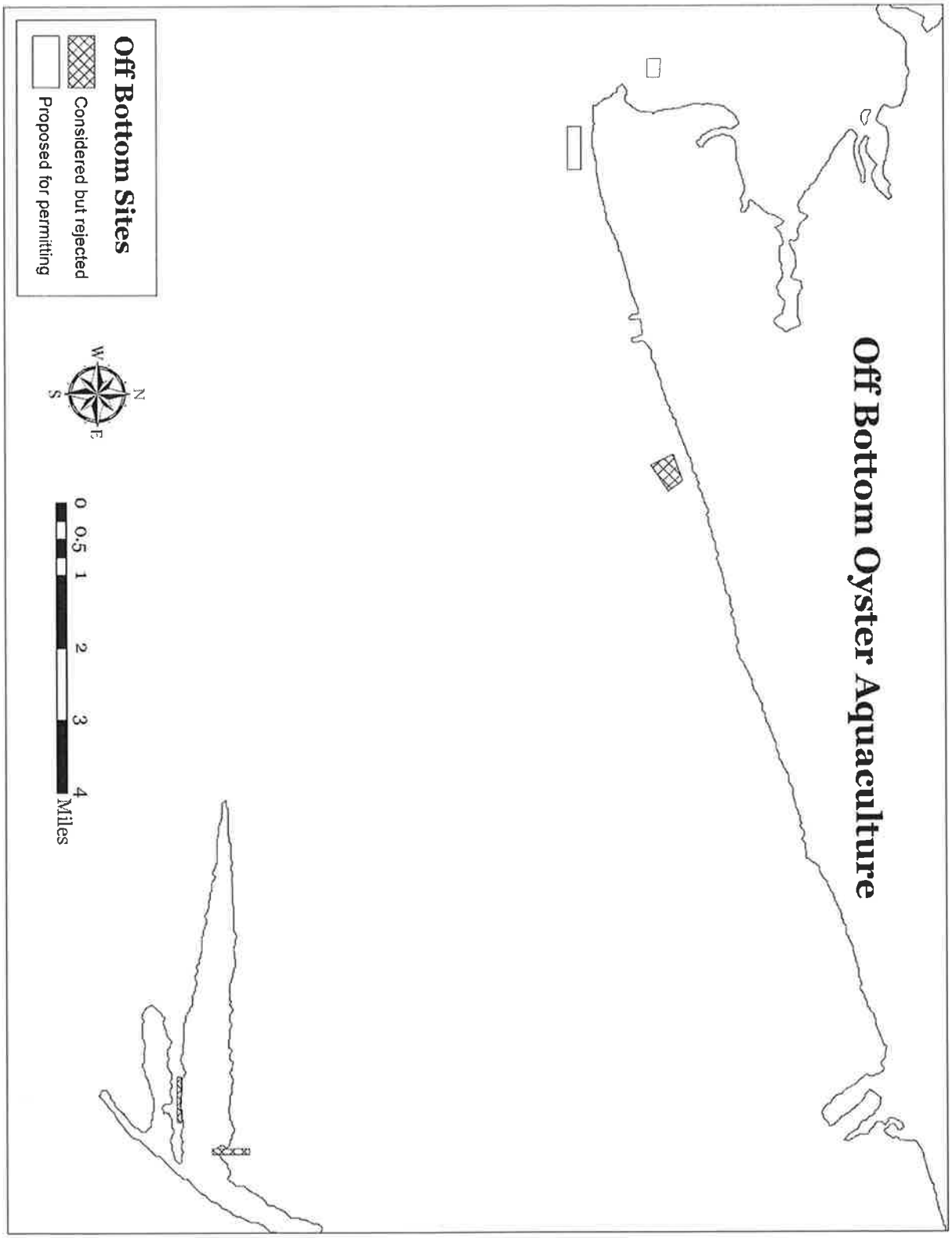


Figure-6. Off-bottom oyster aquaculture sites in the western Mississippi Sound and Bay of St. Louis that were considered by MDMR. Sites pictured are Between the Bridges, Henderson Point, Menge Avenue, and Cat Island (west to east)

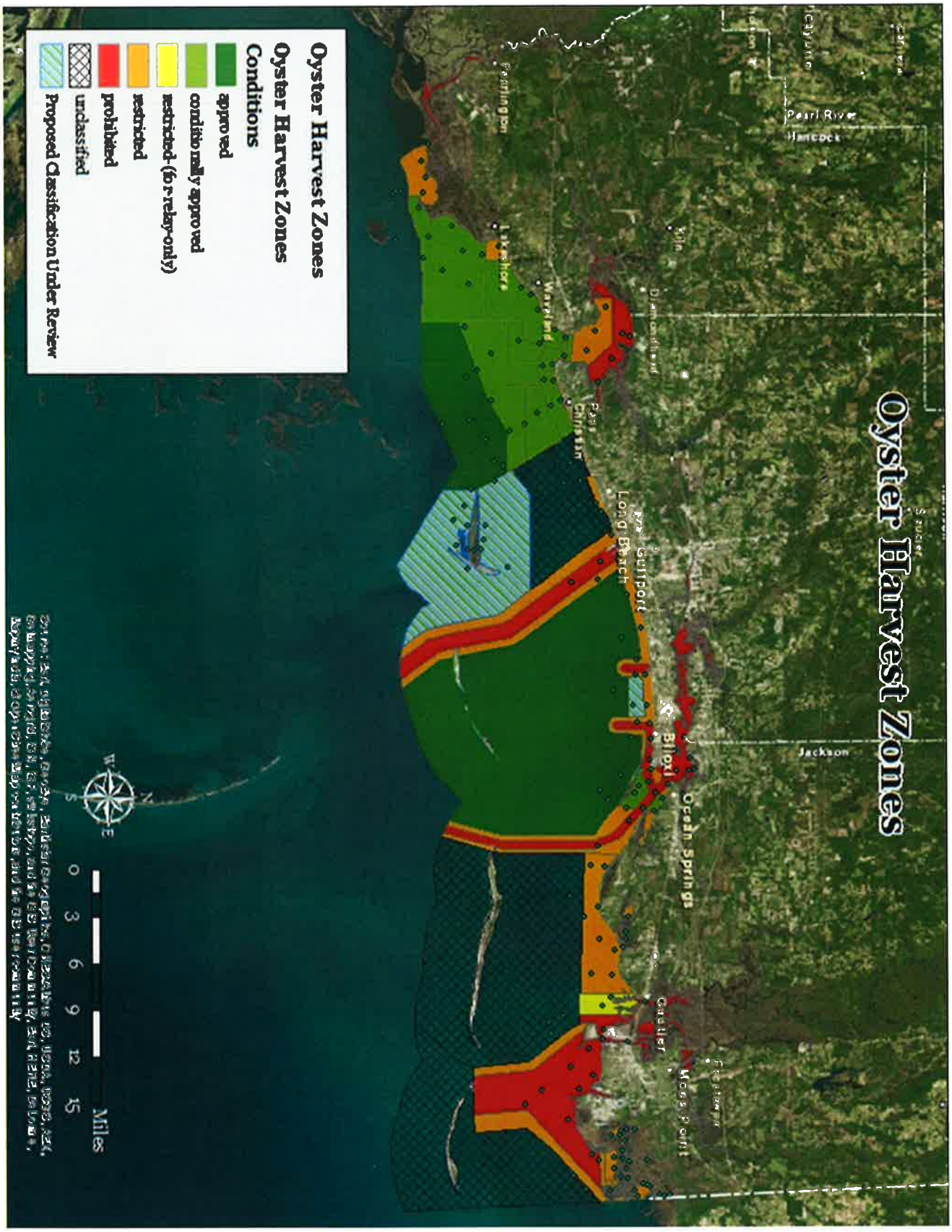
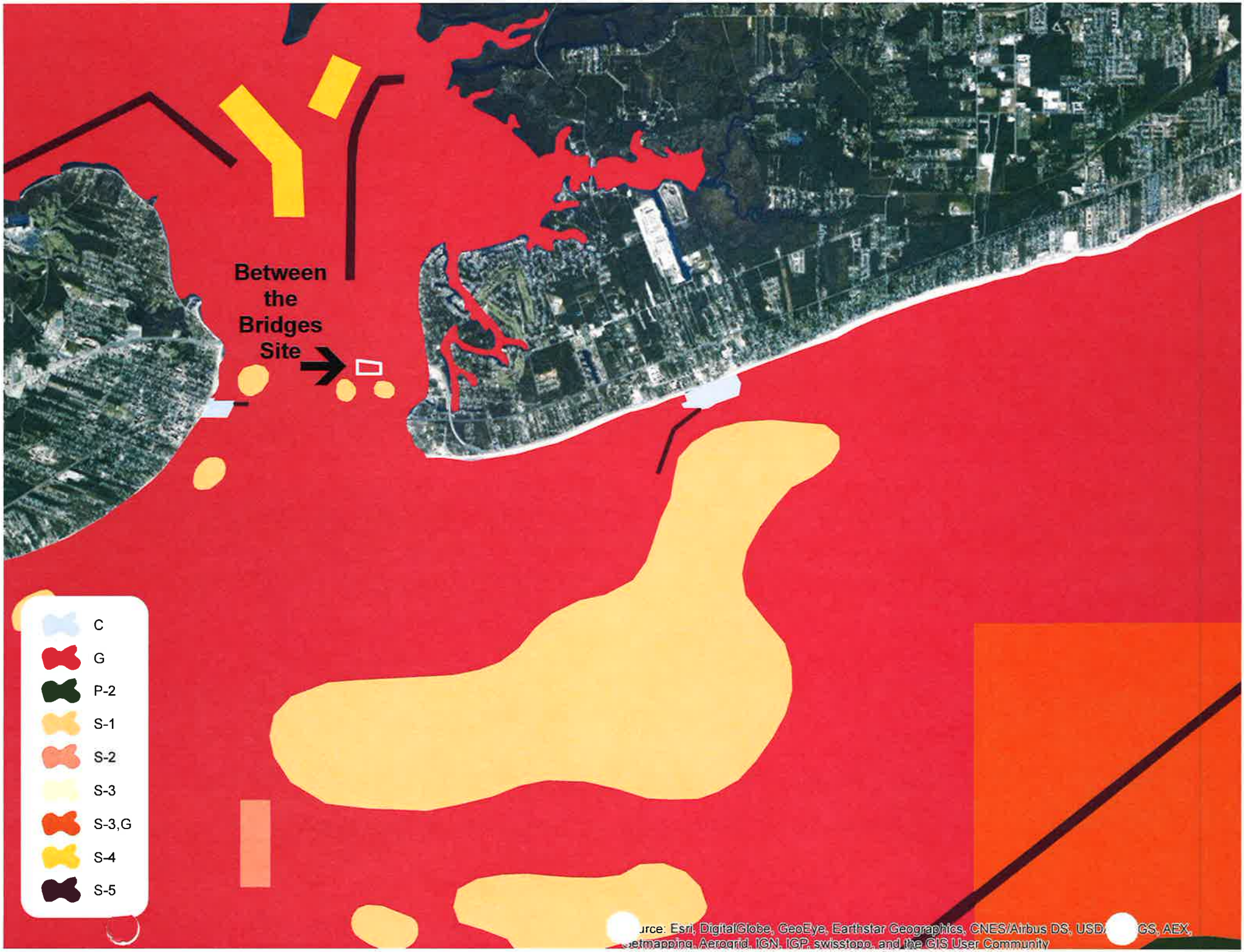


Figure-7. Current shellfish growing waters classification map of the waters of the Mississippi Sound

Figure-8. Bottom type and depth sounding profile of Between the Bridges oyster aquaculture site.


Between the Bridges Site
C
G
P-2
S-1
S-2
S-3
S-3,G
S-4
S-5
urce: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USD GS, AEX, etmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community