

**BID PACKAGE  
FOR**

**LAKE BORGNE SHORELINE PROTECTION PROJECT  
(PO-30)**

**ST BERNARD PARISH, LOUISIANA**



**LOUISIANA  
DEPARTMENT OF NATURAL RESOURCES  
COASTAL ENGINEERING DIVISION**

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## SCHEDULE OF BID ITEMS

### LAKE BORGNE SHORELINE PROTECTION PROJECT (PO-30)

ITEM No.	ITEM	UNIT	QUANTITY <sup>1</sup>	UNIT PRICE <sup>2</sup>		EXTENDED PRICE <sup>2</sup>
				USING WORDS	USING NUMBERS	USING NUMBERS
1	Mobilization and Demobilization <sup>3</sup>	Lump Sum	1	_____ Dollars	\$ _____ . _____	\$ _____ . _____
				_____ Cents		
2	Surveying	Lump Sum	1	_____ Dollars	\$ _____ . _____	\$ _____ . _____
				_____ Cents		
3	Access and Flotation Channels	Lump Sum	1	_____ Dollars	\$ _____ . _____	\$ _____ . _____
				_____ Cents		
4	Geogrid Composite	Square Yard	80,261	_____ Dollars	\$ _____ . _____	\$ _____ . _____
				_____ Cents		
5	250 Lb Class Rock	Ton	172,432	_____ Dollars	\$ _____ . _____	\$ _____ . _____
				_____ Cents		
6	Settlement Plates	Each	30	_____ Dollars	\$ _____ . _____	\$ _____ . _____
				_____ Cents		
7	Permanent Warning Signs	Each	31	_____ Dollars	\$ _____ . _____	\$ _____ . _____
				_____ Cents		
8	Steel Sheet Pile	Square Foot	112,546	_____ Dollars	\$ _____ . _____	\$ _____ . _____
				_____ Cents		
9	Galvanized Steel Tube Walers	Linear Feet	3,242	_____ Dollars	\$ _____ . _____	\$ _____ . _____
				_____ Cents		
10	Galvanized Steel Waler Splices	Each	203	_____ Dollars	\$ _____ . _____	\$ _____ . _____
				_____ Cents		
11	Tie Rod Assemblies	Each	203	_____ Dollars	\$ _____ . _____	\$ _____ . _____
				_____ Cents		
12	Sand Fill	Cubic Yard	4,650	_____ Dollars	\$ _____ . _____	\$ _____ . _____
				_____ Cents		
<b>TOTAL AMOUNT OF BASE BID:</b>				_____ Dollars	_____ Cents	

1. Where the quantity of Work with respect to any item is covered by a unit price, such quantities are estimated quantities to be used when comparing bids and the right is reserved by the Owner to increase/decrease such quantities as may be necessary to complete the Work or remain within any funding limits. In the event of material underruns/overruns, the unit costs will be used to determine payment to the Contractor.
2. Items must be completed by the bidder. The completed sheet must be attached to the bid submitted to the Office of State Purchasing in order for the bid to be considered. The low Bidder will be determined on the basis of the Base Bid alone.
3. Mobilization and Demobilization shall include all appropriate costs associated with constructing all features listed in the Specifications and/or shown in the Plans.

## **PART I      GENERAL PROVISIONS**

### **GP-1    DEFINITION OF TERMS**

Whenever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to the singular or plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

Unless stated otherwise in the Contract Documents, words or phrases which have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

- 1.1      Acceptance: A written approval from the Engineer which certifies that specific items of work in the Contract have been completed and/or obligations have been fulfilled by the Contractor.
- 1.2      Addenda: Those written or graphic documents which are issued prior to opening of Bids in accordance with the Bidding Requirements and clarify or change the bidding requirements or the proposed Contract Documents.
- 1.3      Agreement: The written and signed agreement between the Owner and Contractor specifying the Work to be performed and includes the Contract Documents, all addenda pertaining to the Bid, Notice of Award, Bonds, Plans, General Provisions, Special Provisions, and Technical Specifications.
- 1.4      Application of Payment: That form which is used by the Contractor to request partial and final payment and is deemed acceptable to the Owner. It shall be accompanied by any supporting documentation required by the Contract Documents.
- 1.5      A.S.T.M.: American Society for Testing Materials.
- 1.6      Bid: An offer or proposal submitted on the prescribed form setting forth the prices for the Work.
- 1.7      Bidder: The person, association of persons, firm or corporation submitting a proposal for the Work.
- 1.8      Bidding Requirements: The Advertisement or Invitation to Bid, Instruction to Bidders, Form of Bid Security, if any, and Bid Form with any supplements.
- 1.9      Change Order: A written order which is submitted to the Contractor, signed by the Owner, and authorizes an addition, deletion or revision in the Work, or an adjustment in the contract price or the contract time issued after the effective date of the Agreement.
- 1.10     Claim: A written demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both or other relief with respect to the terms of the Contract.
- 1.11     Contract: The written Agreement between the Owner and the Contractor which defines the work to be completed and shall be understood to include the Plans, Specifications, Information for Bidders, Agreement, Advertisement For Bidders, Affidavit, Bid Form, Bid Bond, Contract Bond, Notice of Award, Notice to Proceed, and Change Orders, and Claims.
- 1.12     Contract Bond: The approved form of security furnished by the Contractor and Surety for the faithful performance of the Work, and the payment for all labor, materials, and/ or obligations incurred by the Contractor in the prosecution thereof.

- 1.13 Contract Documents: The Agreement, all addenda which pertains to the Contract Documents, Bid Documents and specified Attachments accompanying the Bid and any post-bid documentation submitted prior to the Notice of Award, Contractor's Bid when attached as an exhibit to the Agreement, the Bonds (Bid and Performance/Payment), General Provisions, Special Provisions, Technical Specifications, Plans, and all Field or Change Orders issued after the execution of the Agreement. Shop Drawings and other submittals by the Contractor are not Contract Documents.
- 1.14 Contract Price: The moneys payable by the Owner to the Contractor for the Work in accordance with the Contract Documents as stated in the Agreement.
- 1.15 Contract Time: The number of calendar days specified in the Agreement for completion of the Work, together with any extensions authorized through change orders.
- 1.16 Contractor: The person, association of persons, firm or corporation entering into the duly awarded Contract.
- 1.17 Contracting Agency: The Louisiana Department of Natural Resources (DNR) acting through the Division of Administration.
- 1.18 Day: When any period of time is referred to in the Contract Documents using days, it will be computed to exclude the first day and include the last day of such period. If the last day of any such period falls on a Saturday, Sunday or a legal holiday, that day will be omitted from the computation. A calendar day is measured as twenty-four (24) hour period starting at midnight and ending the following midnight.
- 1.19 Design Report: A written report by the Engineer which provides the design methodology for the Work.
- 1.20 Effective Date of the Agreement: The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
- 1.21 Engineer: The Louisiana Department of Natural Resources, Coastal Engineering Division.
- 1.22 Equipment: All machinery, implements, and power-tools, in conjunction with the necessary supplies for the operation, upkeep, maintenance, and all other tools and apparatuses necessary for the proper construction and acceptable completion of the Work.
- 1.23 Extension of Contract: Any extension of time for completion of the Work beyond the Contract Time which is granted by the Owner and recommended by the Engineer.
- 1.24 Federal Sponsor: The federal agency responsible for sponsoring the project.
- 1.25 Field Order: A written order issued by the Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or Contract Time.
- 1.26 Inspector: An authorized representative of the Engineer who is responsible to inspect the Work and materials furnished by the Contractor.
- 1.27 Laboratory: The firm, company or corporation which is used to test materials and is approved for use by the Engineer.
- 1.28 Laws and Regulations; Laws or Regulations: Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
- 1.29 Materials: Any substance used in the Work to build structures, but does not include material used in false work or other temporary structures not incorporated in the Work.

- 1.30 Milestone: A principal event specified in the Contract Documents relating to an intermediated completion date or time prior to the Contract Times.
- 1.31 Notice of Award: A written notice to the successful Bidder stating that the Owner will sign and deliver the Agreement.
- 1.32 Notice to Proceed: The written notice to the Contractor by the Owner which provides the starting date for the Contract Time.
- 1.33 Owner: The Owner is the State of Louisiana (State) which acts through the Contracting Agency.
- 1.34 Plans: That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, intent, and character of the Work to be completed by the Contractor.
- 1.35 Right-of-way: That entire area reserved for constructing, maintaining and protecting the proposed improvement, structures, and appurtenances of the Work.
- 1.36 Samples: Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portions of the Work will be judged.
- 1.37 Shop Drawings: All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for the Contractor and submitted by the Contractor to illustrate some portion of the Work to be performed.
- 1.38 Project Site: The location where the Work is to be performed as stated in the Agreement.
- 1.39 Specifications: That part of the Contract Documents consisting of written technical descriptions of materials, equipment, systems, standards and workmanship as applied to the work to be performed and certain administrative details applicable thereto.
- 1.40 State: The State of Louisiana.
- 1.41 Structures: Bridges, plugs, weirs, berms, dams, levees, and other miscellaneous construction encountered during the Work and not otherwise classified herein.
- 1.42 Subcontractor: Any person, association of persons, firm, or corporation who contracts with the Contractor to perform any part of the project covered by the Contract.
- 1.43 Successful Bidder: The lowest responsible Bidder whom the Owner makes an award.
- 1.44 Special Provisions: That part of the Contract Documents which amends or supplements these General Provisions.
- 1.45 Surety: The corporate body, licensed to do business in Louisiana, bound with and for the Contractor's primary liability, and engages to be responsible for payment of all obligations pertaining to acceptable performance of the Work contracted.
- 1.46 Temporary Structures: Any non-permanent structure required while engaged in the prosecution of the Contract.
- 1.47 Written Amendment: A written statement modifying the Contract Documents which is signed by the Owner and the Contractor on or after the Effective Date of the Agreement.
- 1.48 Work: All work specified herein or indicated on the Plans.
- 1.49 Work Plan: A written plan by the Contractor that details how the Work will be provided including layout drawings, projected schedule (Initial Progress Schedule), and a list of labor hours and materials.

## GP-2 BID REQUIREMENTS

The Contract and Bonds which govern the Work shall be performed in accordance with the Plans, Specifications, and the latest edition of the Louisiana Standard Specifications for Roads and Bridges. The Bidder understands that all quantities for performing the Work have been estimated by the Engineer, and that the Bid shall be the sum of the quantities multiplied by their respective unit rates. The Contract shall be awarded by the Owner through a comparison of all bids. It is the responsibility of each Bidder before submitting a Bid to:

- 2.1 Examine the Bidding Documents including the Plans and Specifications and any Addenda or related data identified in the Bidding Documents;
- 2.1. Visit the Project Site to become familiar with the local conditions if they are believed to affect cost, progress or the completion of the Work;
- 2.2. Become familiar and satisfied with all federal, state, and local Laws and Regulations that may affect cost, progress, or the completion of the Work;
- 2.3. Study and correlate all information known to the Bidder including observations obtained from Bidder's visits, if any, to the Project Site, with the Bidding Documents;
- 2.4. Submit a written notice to the Engineer within three (3) days regarding any conflicts, errors, ambiguities, or discrepancies discovered in the Bidding Documents and confirm that the written resolution thereof by the Engineer is acceptable to the Bidder; and
- 2.5. Determine that the Bidding Documents are generally sufficient to convey an understanding of all terms and conditions for completing the required Work.

The submission of a Bid will constitute an incontrovertible representation that the Bidder has complied with every requirement of these Specifications. The Bidder shall comply with all other requirements specified in the Notice to Bidders.

## GP-3 AVAILABILITY OF PLANS AND SPECIFICATIONS

One (1) set of Plans and Specifications shall be furnished to each Bidder. Three (3) sets of the Plans and Specifications shall be furnished to the Contractor upon award of the Contract. Additional sets may be furnished upon request from the Coastal Engineering Division of the Louisiana Department of Natural Resources, 617 North 3rd Street, 10th Floor, Baton Rouge, Louisiana 70804.

## GP-4 LAWS, REGULATIONS, STANDARDS, SPECIFICATIONS AND CODES

Bidders are required to become familiar and remain in compliance with all Federal, State, and local laws, ordinances, and regulations which may affect all employees and execution of the Work. The filing of a bid will be presumptive evidence that the Bidder has complied with this requirement. The Owner will not be responsible for any inaccurate interpretations or conclusions drawn by the Contractor from information and documentation provided by the Owner.

References to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws and Regulations, whether such reference be specific or by implication, may not be in effect at the time of opening the Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents. No provision of any such standard, specification, manual or code, or any instruction of a supplier shall be effective to change the duties or responsibilities of the Owner or Engineer, or any of their Subcontractors, consultants, agents, or employees from those set forth in the Bid Documents. No such provision shall be effective to assign to the Owner or Engineer, or any of their consultants, agents, or employees any duty or authority to supervise or direct the performance of the Contractor's obligations or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.



The Contractor shall indemnify the Owner and its representatives against any claim or liability arising from all violations of any laws, bylaws, ordinances, codes, regulations, orders or decrees. The obligations imposed by these specifications are in addition to and are not to be construed in any way as a limitation of any rights available to the Engineer or Owner which are otherwise imposed by any laws or regulations, or other provisions within the Contract Documents.

#### GP-5 PRE-BID CONFERENCE AND SITE VISIT

A pre-bid conference will be held at the location and on the date provided in the Bid publications. A site visit will also be held at the Project Site and on the date provided at the pre-bid conference. Bidders will be required to furnish their own transportation to the Project Site. Representatives of the Owner and Engineer will attend both meetings to discuss the Work. Bidders are required to attend the pre-bid conference and site visit. Failure to attend will result in a null or void Bid.

All questions shall be faxed to the Engineer listed in SP-4 by the date provided in SP-3. No additional questions shall be received after this date. Oral statements will not be binding or legally effective. The Engineer will submit addenda in response to all questions arising at the Pre-Bid Conference and site visit to all prospective Bidders on record. All Bidders may contact the Engineer for any additional information.

#### GP-6 NOTICE OF AWARD

The Owner shall provide written notice to the Successful Bidder stating that the Owner will sign and deliver the Agreement upon compliance with the conditions enumerated therein and within the time specified.

#### GP-7 NOTICE TO PROCEED AND CONTRACT TIME

The Contractor shall start the Work and begin the Contract Time on the dates provided in the Notice to Proceed. The Work shall be conducted using sufficient labor, materials and equipment as necessary to insure completion within the Contract Time. The Contract Time for completion of the Base Bid for the Work is provided in SP-3, unless an extension is granted to the Contract Time as specified in GP-45.

#### GP-8 WORK PLAN

The Contractor shall develop a written Work Plan which accounts for all of the construction activities required by the Contract Documents. The Work Plan shall include a list of the individual construction tasks to be completed and the estimated dates for beginning and completing the tasks. It shall also include all other items which are applicable to completing the Work such as, but not limited to, the following:

- 8.1 Typical report form for the Weekly Progress Meeting;
- 8.2 Typical form for Daily Progress Report;
- 8.3 Hurricane and Severe Storm Plan;
- 8.4 Health and Safety Plan;
- 8.5 The delivery method and source (s) of all construction materials (company or producer name, mailing and physical address, phone number, and name of contact person).
- 8.6 The personnel, material, subcontractors, fabricators, suppliers, and types of equipment the Contractor proposes to use for construction;
- 8.7 Survey layout and stakeout;
- 8.8 All supplemental items specified in SP-5.

The Work Plan shall be submitted to the Engineer prior to the Pre-Construction Conference by the date provided in SP-3. The Engineer shall review the Work Plan and have the Contractor make any necessary revisions prior to acceptance of the plan.

## GP-9 PROGRESS SCHEDULE

The Contractor shall develop a written Progress Schedule which provides for an orderly progression of the Work, submittals, tests, and deliveries in order to complete the Work within the specified Milestones and Contract Time. All of the items listed in the Work Plan shall be integrated into the Progress Schedule. The format of the schedule shall be composed using Microsoft Project®, or any other software deemed acceptable by the Engineer. It shall be updated weekly by the Contractor, at a minimum. The Progress Schedule shall also include, but not be limited to the following:

- 9.1 All of the elements in the Work Plan, including updates;
- 9.2 A work order issued from Louisiana One Call ordering all their subscribers in the project area to mark their utilities;
- 9.3 A telephone log verifying that all property owners and utilities have been contacted. This log should list the time, date, and names of the personnel representing the property owners, utilities and Contractor;
- 9.4 Shop drawings, test results and sample submittals;

The following table defines the monthly anticipated adverse weather days that are expected to occur during the Contract Time and will constitute the baseline monthly weather time for evaluations. The schedule is based upon National Oceanic and Atmospheric Administration (NOAA) or similar data for the regional geographic area.

Monthly Anticipated Adverse Weather Calendar Days											
Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
5	5	4	4	4	5	7	7	5	3	3	4

The Progress schedule must reflect these anticipated adverse weather delays on all weather dependent activities. Adverse weather days must prevent Work for fifty percent (50%) or more of the work day and delay work critical to the timely completion of the project. The number of actual adverse weather days shall be calculated chronologically from the first to the last day of each month.

The Progress Schedule shall be submitted to the Engineer prior to the Pre-Construction Conference by the date provided in SP-3. The Engineer shall perform a review and have the Contractor make any necessary revisions prior to acceptance of the schedule. Acceptance will not impose responsibility on the Owner or Engineer for the sequencing, scheduling, or progression of the Work. The Contractor is fully responsible to advance the progression of the Work in order to maintain the compliance with the Progress Schedule.

## GP-10 DAILY PROGRESS REPORTS

The Contractor shall record the following daily information on Daily Progress Reports:

- 10.1 Date and signature of the author of the report;
- 10.2 Amount of all bid items that are fabricated, installed, backfilled, pumped, constructed, damaged, replaced, etc. The amount of material shall be expressed in the units stated in the bid;
- 10.3 Field notes of all surveys;
- 10.4 Notes on all inspections;

- 10.5 Details of Health and Safety meetings;
- 10.6 A brief description of any Change Orders, Field Orders, Claims, Clarifications or Amendments;
- 10.7 Condition of all navigation aides (I.E., warning signs, lighted marker buoys) and any repairs performed on them;
- 10.8 Weather conditions (adverse weather day, wind speed and direction, temperature, wave height, precipitation, etc.);
- 10.9 The amount of time lost to severe weather or personnel injury, etc;
- 10.10 Notes regarding compliance with the Progress Schedule;
- 10.11 Visitor log

The daily progress reports shall be submitted to Engineer at the Weekly Progress Meetings specified in GP-13 in both hard copy and digital format (Adobe Acrobat® Format, or approved equal). The typical form for Daily Progress Reports shall be developed by the Contractor and incorporated into the Work Plan.

## GP-11 HURRICANE AND SEVERE STORM PLAN

The Contractor shall develop and maintain a written Hurricane and Severe Storm Plan. The Plan shall include, but not be limited to, the following:

- 11.1 What type of actions will be taken before storm strikes at the Project Site. The plan should specify what weather conditions or wave heights will require shutdown of the Work and removal of equipment, personnel, etc.
- 11.2 Notes from continuous monitoring of NOAA marine weather broadcasts and other local commercial weather forecasts.
- 11.3 Equipment list with details on their ability to handle adverse weather and wave conditions.
- 11.4 List of safe harbors or ports and the distance and travel time required to transfer equipment from the Project Site.
- 11.5 Hard copies of any written approvals or operations schedules associated with the use of the safe harbors or ports.
- 11.6 Method of securing equipment at the safe harbors or ports.
- 11.7 List of tug boats and work boats and their respective length, horsepower, etc. which will adequately transfer the equipment to safe harbor or port under adverse weather conditions.
- 11.8 Methods which will be used to secure equipment left onsite during adverse weather conditions.
- 11.9 Evacuation or immediate reaction plans to be taken by personnel for sudden storm occurrences.
- 11.10 Operations procedures which will be used to secure critical dredging equipment such as spuds, swing wires, anchor wires, or tugs during adverse weather conditions.

The Contractor shall incorporate the Hurricane and Severe Storm Plan into the Work Plan. The Owner and Engineer are not responsible for the adequacy of this plan.

## GP-12 HEALTH AND SAFETY PLAN AND INSPECTIONS

The Contractor shall develop and maintain a written Health and Safety Plan which allows the Work to be performed in compliance with all applicable laws, ordinances, rules, and regulations of any government agency having jurisdiction over the safety of personnel or property. This includes maintaining compliance with the Code of Federal Regulations, Title 29, Occupational Safety and Health Administration (OSHA) and all applicable Health and Safety Provisions of the State of Louisiana.

The Contractor shall institute a daily inspection program to assure that the requirements of the Health and Safety Plan are being fulfilled. Inspections shall include the nature of deficiencies observed, corrective action taken or to be taken, location of inspection, date, and signature of the person responsible for its contents. The results of the inspections shall be recorded on Daily Progress Reports and kept at the Project Site during the Work.

The Contractor shall incorporate the Health and Safety Plan into the Work Plan. The Owner and Engineer are not responsible for the adequacy of this plan.

## GP-13 WEEKLY PROGRESS REPORT AND MEETING

The Engineer shall schedule and hold weekly progress meetings to review the progress of the Work, coordinate future efforts, discuss compliance with the Progress Schedule and resolve miscellaneous problems. The Engineer or Inspector, Contractor and all Subcontractors actively working at the Project Site shall attend each meeting. Representatives of suppliers, manufacturers and other Subcontractors may also attend at the discretion of the Contractor. The Contractor shall record the details of each meeting in the Weekly Progress Report. The format of this report shall be developed by the Contractor and included in the Work Plan.

## GP-14 PRE-CONSTRUCTION CONFERENCE

A Pre-Construction Conference shall held by the Contractor, Subcontractors, Owner, Engineer, local stakeholders and other appropriate personnel prior to starting construction on the date specified in SP-3. This conference shall serve to establish a mutual understanding of the Work to be performed, the elements of the Progress Schedule and Work Plan, expectations for weekly progress meetings, the Plans and Specifications, processing Applications for Payment, and any other items of concern.

## GP-15 CONTRACT INTENT

The Bid Documents are complementary; what is called for by one is as binding as if called for by all. Clarifications and interpretations or notifications of minor variations and deviations of the Contract Documents will be issued by Engineer as provided in GP-16. Any labor, documentation, services, materials, or equipment that may reasonably be inferred from the Bid Documents or from prevailing custom or trade usage as being required to produce the intended result will be provided at no additional cost to the Owner.

## GP-16 ENGINEER AND AUTHORITY OF ENGINEER

The Engineer will be the designated representative of the Owner, the initial interpreter of the Contract Documents and the judge over acceptability of all the Work. Claims, disputes, and other matters relating to the acceptability of the Work, performance by the Contractor or the interpretation of the requirements of the Contract Documents must be submitted to the Engineer in writing. Upon written request from the Contractor, the Engineer shall issue written clarifications or interpretations which are consistent with the overall intent of the Contract Documents. Such written clarifications and interpretations will be binding on the Owner and the Contractor. Either the Owner or the Contractor may make a Claim if a written clarification or interpretation justifies an adjustment in the Contract Price or Contract Times.

The Engineer has the authority to suspend the Work in whole or in part due to failure of the Contractor to correct conditions unsafe for workmen or the general public, carry out provisions of the Contract, perform conformance work, or to carry out orders. The Engineer shall submit a written order to the Contractor for work which must be suspended or resumed.

The Engineer or Inspector shall keep a daily record of weather and flood conditions and may suspend the Work as deemed necessary due to periods of unsuitable weather, conditions considered unsuitable for execution of the Work, or for any other condition or reason deemed to be in the public interest.

## GP-17 CONFORMITY WITH PLANS AND SPECIFICATIONS

All work and materials involved with the Work shall be in reasonably close conformity with the lines, grades, cross sections, dimensions, and other requirements shown on the Plans or indicated in these Specifications.

## GP-18 CLARIFICATIONS AND AMENDMENTS TO CONTRACT DOCUMENTS

The Contract Documents may be clarified or amended by the Engineer to account for additions, deletions, and revisions to the Work after the Effective Date of the Agreement. The clarifications and amendments shall be addressed by either a Change Order or a written clarification by the Engineer. The Contractor shall not proceed with the Work until the Change Order or clarification has been issued by the Engineer. The Contractor shall not be liable to the Owner or Engineer for failure to report any such discrepancy unless the Contractor had reasonable knowledge.

The Contractor may request a clarification or amendment for the following:

- 18.1 Any conflict, error, ambiguity, or discrepancy within the Contract Documents; or
- 18.2 Any conflict, error, ambiguity, or discrepancy between the Bid Documents and the provision of any Law or Regulation applicable to the performance of the Bid; or
- 18.3 Any standard, specification, manual or code (whether or not specifically incorporated by reference in the Bid Documents); or
- 18.4 Instructions by a supplier.

The official form for a written clarification is provided in Appendix A. This form shall be filled out appropriately by the Contractor and submitted to the Engineer. The Engineer shall clarify the issue in writing on either the clarification form or a Change Order and submit it to the Contractor.

## GP-19 SUBCONTRACTS

The Contractor shall provide the names of the Subcontractors proposed to perform any of the Work to the Engineer in writing as soon as practicable and before awarding any Subcontracts. The Contractor shall not employ any person found objectionable by the Engineer.

The Contractor shall be responsible for the coordination of the trades and Subcontractors engaged in the Work. The Contractor is fully responsible to the Owner for the acts and omissions of all of the Subcontractors. The Owner and Engineer will not settle any differences between the Contractor and Subcontractors, or between Subcontractors. The Contractor shall have appropriate provisions in all Subcontracts to bind Subcontractors to the Contractor by the terms of the General Conditions and other Contract Documents, as applicable to the Work of Subcontractors. The provisions should provide the Contractor the same power regarding termination of Subcontracts that the Owner may exercise over the Contractor under any provisions of the Contract Documents.

## GP-20 WORKERS, METHODS AND EQUIPMENT

The Contractor shall provide competent, qualified and trained personnel to perform the Work. The Contractor shall provide the names of the Subcontractors to the Engineer in writing before awarding any Subcontracts. The Contractor shall not employ any person found objectionable by the Engineer. Any person employed by the Contractor or any Subcontractor who, in the opinion of the Engineer does not perform the Work in a proper, skillful and orderly manner shall be immediately removed upon receiving a written order by the Engineer. The Engineer may also suspend the Work until the Contractor removes the employee or provides a suitable replacement. Such an employee shall not be re-employed in any portion of the Work without written approval from the Engineer.

The on-site superintendent for the Contractor shall be competent, English-speaking, and qualified to receive orders, supervise, and coordinate all Work for the Contractor and any Subcontractors. The qualifications of the superintendent must be established and approved by the Engineer prior to commencement of the Work. The superintendent shall be furnished by the Contractor regardless of how much Work may be sublet. In the performance of the Work under this Contract, the Contractor shall conduct operations to avoid interference with any other Contractors.

All equipment, products and material incorporated into the Work shall be as specified, or if not specified, shall be new, of good quality and protected, assembled, used, connected, applied, cleaned and conditioned in accordance with the manufacturer's instructions, except as otherwise may be provided in the Bid Documents. All equipment shall be of sufficient size and mechanical condition to meet the requirements of the Work and produce a satisfactory quality of work. Equipment shall not damage adjacent property throughout the performance of the Work.

The Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures used to complete the Work in conformance with the Contract Documents.

The Contractor shall obtain permission from the Engineer if a method or type of equipment other than specified in the Contract is desired. The request shall be in writing and shall include a full description of the methods, equipment proposed, and reasons for the modification. A proposed item of material or equipment may be considered by the Engineer to be functionally equal to an item specified in the Contract if:

- 20.1 It is at least equal in quality, durability, appearance, strength, and design characteristics;
- 20.2 There is no increase in any cost including capital, installation or operating to the Owner;
- 20.3 The proposed item will conform substantially, even with deviations, to the detailed requirements of the item named in the Bid Documents.

If, after trial use of the substituted methods or equipment, the Engineer determines that the Work produced does not meet Contract requirements, the Contractor shall discontinue use of the substituted methods or equipment and shall complete the Work with the specified methods and equipment. The Contractor shall remove the deficient Work and replace it with Work of specified quality or take other corrective action as directed. No change will be made in basis of payment for construction items involved or in Contract Time as a result of authorizing a change in methods or equipment.

## GP-21 ACCIDENT PREVENTION, INVESTIGATIONS, AND REPORTING

The Contractor shall be responsible to develop and maintain all safeguards and safety precautions necessary to prevent damage, injury, or loss throughout the performance of the Work. All accidents at the Project Site shall be investigated by the immediate supervisor of employee(s) involved and reported to the Engineer or Inspector within one (1) working day. A complete and accurate written report of the accident including estimated lost time days shall be submitted to the Engineer within four (4) calendar days. A follow-up report shall be submitted to the Engineer if the estimated lost time days differ from the actual lost time days.

## GP-22 PRESERVATION AND RESTORATION OF PROPERTY, MONUMENTS, ETC.

The Contractor is responsible to comply with all applicable laws, ordinances, rules, and regulations of any government agency having jurisdiction over the preservation and protection of public and private property. The Contractor shall install and maintain suitable safeguards and safety precautions during the Work as necessary to prevent damage, injury, or loss to property. This responsibility shall remain with the Contractor until the Work has been completed and accepted. Any damage, injury or loss to property which is caused by the Contractor or Subcontractors shall be repaired or replaced at the expense of the Contractor.

The Contractor shall protect all land monuments, State and United States bench marks, geodetic and geological survey monuments, and property markers from disturbance or damage until an authorized agent has witnessed or otherwise referenced their location. The Contractor shall also provide protection for all public and private property including trees, utilities, pipes, conduits, structures, etc. These items shall not be removed unless directed by the Engineer.

The Contractor shall be responsible to completely repair all damages to public or private property due to any act, omission, neglect or misconduct in the execution of the Work unless it is due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God, public enemies or governmental authorities. The damage must be repaired at the expense of the Contractor before final acceptance of the Work can be granted by the Engineer. If the Contractor fails to repair the damage within forty-eight (48) hours, the Owner may independently proceed with the repairs at the expense of the Contractor by deducting the cost from the Contract. If the Contractor cannot provide for the cost of repairs, the Surety of the Contractor shall be held until all damages, suits, or claims have been settled.

## GP-23 PROTECTION OF THE WORK, MATERIALS AND EQUIPMENT

It shall be the responsibility of the Contractor to protect the Work, materials and equipment from damages or delays due to inflows, tidal rise, and storm water runoff which may occur at the Project Site. The Owner shall not be held liable or responsible for these types of delays or damages.

## GP-24 LAND RIGHTS

The Owner has been granted all of the temporary easements, servitudes and right-of-way agreements from public and private landowners in order to perform the Work. A land rights memorandum which lists all known responsible contacts and required stipulations is provided in Appendix B. The Contractor is responsible to notify all of the contacts and abide by stipulations listed in that memorandum.

## GP-25 UTILITIES

The Owner has been granted all of the temporary easements, servitudes and right-of-way agreements from public and private utilities in order to perform the Work. The utilities include, but are not limited to telephone, telegraph, power poles or lines, water or fire hydrants, water or gas mains and pipelines, sewers, conduits and other accessories or appurtenances of a similar nature which are fixed or controlled by a city, public utility company or corporation. A land rights memorandum is provided in Appendix B which lists all responsible contacts and required stipulations.

The Contractor shall conduct the Work in such a manner as to cooperate and minimize inconveniences with utilities. Prior to commencement of the Work, the Contractor is responsible to notify all of the utilities, abide by stipulations listed in the land rights memorandum, and make any necessary adjustments. The Contractor shall also call A Louisiana One Call® at 1-800-272-3020 a minimum of 5 working days prior to construction to locate existing utilities at the Project Site.

Any damage to utilities that is caused by the Contractor within the Project Site shall be repaired at the expense of the Contractor. The Owner will not be responsible for any delay or damage incurred by the Contractor due to working around or joining the Work to utilities left in place or for making adjustments.

Any unidentified pipes or structures which may be discovered within the limits of the Project Site shall not be disturbed. Construction or excavation shall not be performed around unidentified utilities without prior approval from the Engineer.

## GP-26 PERMITS

All Federal and State permits that are required to perform the Work, such as the COE 404 Permit, Coastal Use Permit, and LDEQ Clean Water Permit, have been secured by the Owner. Copies of these permits are provided in Appendix C. These permits will not relieve the responsibility of the Contractor from obtaining any additional permits which may be needed to complete the work. Copies of any special permits that are obtained by the Contractor must be submitted to the Owner. The Contractor shall conform to the requirements therein and display copies of the permits in a public setting at the Project Site at all times.

## GP-27 PROJECT SITE CLEAN-UP

The Contractor shall keep the Project Site free from accumulations of waste material or trash at all times. All trash, tools and waste materials shall be removed by the Contractor after completing the Work. In addition, all non-conforming work shall also be removed prior to the Work being accepted. No materials shall be placed outside of the Project Site.

## GP-28 OWNER INSPECTION

The Owner, Inspector and Federal Sponsor shall have the right to perform reasonable inspections and require reasonable tests of the Work by the Contractor at the Project Site. They shall be granted free access to all parts of the Project Site including all materials intended for use in the Work. The Contractor shall also allow reasonable time for them to perform such inspections or tests. The inspections shall not relieve the Contractor from any obligation in accordance with the requirements of the Contract.

The Contractor shall provide the Owner with a written notice regarding the readiness of the Work at least 30 days prior to all inspections, tests, or approvals which are specified by the Contract Documents. The Owner shall submit a timely notice to the Contractor regarding all specified tests, inspections and approvals of the Work which are to be conducted at the Project Site. The Owner shall submit a prompt notice to the Contractor regarding the results of any inspection or testing. If the results show any nonconformance with the Work, the notice shall identify which option the Owner elects under the provisions in GP-47. Tests and inspections or Payments made by the Owner shall not constitute acceptance of non-conforming Work or prejudice the Owner's rights under the Contract.

## GP-29 DUTIES OF INSPECTOR

An Inspector shall be assigned by the Engineer to the Project Site to observe the Contractor and monitor the progress and manner in which the Work is being performed. The Inspector will also report to the Engineer and Contractor whenever materials or work fail to comply with the Contract. The Inspector is authorized to reject any materials or suspend work which does not comply with the Contract until the issue is resolved by the Engineer.

However, the Inspector is not authorized to revoke, alter, enlarge, relax or release any requirements of the Contract, or to approve or accept any portion of the Work, or to issue instructions contrary to the Plans and Specifications. The Inspector shall not manage or perform duties for the Contractor.

## GP-30 CONSTRUCTION STAKES, LINES, AND GRADES

The Engineer shall direct the Contractor to all control points necessary for setting stakes and establishing lines and grades as shown on the Plan Drawings. The Contractor shall be responsible for laying out all of the Work. All layouts shall be witnessed and verified by the Engineer or Inspector prior to beginning the Work. The Contractor shall be responsible for proper execution of the Work according to the layouts after receiving verification from the Engineer.



The Contractor shall be responsible for furnishing and maintaining stakes which are sufficient in quantity and size. The Engineer may require the Work to be suspended at any time if the stakes are not reasonably adequate to permit verification of the Work.

### GP-31 CONTRACTOR'S RESPONSIBILITY FOR WORK

The Contractor shall execute all items covered by the Contract, and shall furnish, unless otherwise definitely provided in the Contract, all materials, implements, machinery, equipment, tools, supplies, transportation and labor necessary to complete the Work. The Contractor shall pay constant attention to the progress of the Work and shall cooperate with the Engineer in every way possible. The Contractor shall maintain a complete copy of the Contract at all times, including the Plans, Specifications, and any authorized modifications.

### GP-32 CONTROL OF SILTATION AND WATER POLLUTION

The Contractor shall comply with all applicable Federal and State regulations and statutes relating to the prevention and abatement of pollution in the performance of the Contract. The Contractor shall conduct the Work in a manner that will not cause damaging concentrations of silt or pollution to water. The Contractor shall prevent fuels, oils, bituminous materials, chemicals, sewage or other harmful contaminants from entering the land or water.

### GP-33 SANITARY PROVISION

The Contractor shall provide and maintain sanitary accommodations for use by all employees and Subcontractors. Facilities shall comply with the requirements of the Louisiana State Board of Health and Hospitals and other authorities having jurisdiction. Committing public nuisance on the Project Site is prohibited.

### GP-34 PAYMENT OF TAXES

The Contractor shall be responsible for all taxes and duties that maybe levied under existing State, Federal and local laws during the completion of the Work. The Owner will presume that the amount of such taxes is included in the unit prices bid by the Contractor and will not provide additional reimbursement.

### GP-35 RADIO TELEPHONES

The Contractor shall furnish and maintain radio and telephone equipment throughout the Contract Time which will allow communication between the Contractor and the Engineer or Inspector.

### GP-36 NAVIGATION

All marine vessels shall comply with the following Federal Laws and Regulations:

- 36.1 The International Navigational Rules Act of 1977 (Public Law 95-75, 91 Stat. 308, or 33 U.S.C. 1601-1608); and
- 36.2 The Inland Navigation Rules Act of 1980 (Public Law 96-591, 94 Stat. 3415, 33 U.S.C. 2001-2038).

These rules can be found on the Internet at <http://www.navcen.uscg.gov/mwv/navrules/rotronline.htm>. All marine vessels shall display the lights and day shapes required by Part C- Lights and Shapes of the Inland Navigation Rules. The location, type, color, and size of the lights and day shape shall be in accordance with Annex I - Positioning and Technical Details of Lights and Shapes. Any vessel engaged in dredging is considered a "Vessel restricted in her ability to maneuver" and shall display all the lights and shapes required in Rule 27, "Vessel Not Under Control."

## GP-37 OBSTRUCTION TO NAVIGATION

The Contractor shall minimize all obstructions to navigation in compliance with pertinent U. S. Coast Guard regulations while conducting the Work. The Contractor shall promptly move any floating equipment or marine vessels which obstruct safe passage of other marine vessels. Upon completion of the Work, the Contractor shall remove all marine vessels and other floating equipment such as temporary ranges, buoys, piles, and other marks or objects that are not permanent features of the Work.

## GP-38 MARINE VESSELS AND MARINE ACTIVITIES

All marine vessels operated by the Contractor shall possess a valid United State Coast Guard (USCG) inspection certificate and current American Bureau of Shipping (ABS) Classification. All officers and crew shall possess valid USCG licenses as required by USCG regulations. These certificates, classifications and licenses shall be posted in a public area on board each vessel.

All marine vessels not subject to USGS certification or American Bureau of Shipping (ABS) Classification shall be inspected annually by a marine surveyor accredited by the National Association of Marine Surveyors (NAMS) or the Society of Accredited Marine Surveyors (SAMS). All inspections shall be documented using an appropriate report format. At a minimum, the inspections shall evaluate the structural integrity of the vessel and comply with the National Fire Protection Association Code No. 302- Pleasure and Commercial Motor Craft. The most recent inspection report shall be posted in a public area on board each vessel.

## GP-39 TRANSPORTATION

The Contractor shall provide a safe and reasonable means of transportation to and from the dock, staging area and Project Site for personnel from LDNR and the Federal Sponsor throughout the Work. The schedule and pickup location shall be arranged by LDNR and the Contractor prior to mobilization. Upon request, overnight room and board shall be provided to these personnel by the Contractor if adequate facilities are available. The Contractor shall provide a boat for the exclusive use of the Engineer and/or Inspector to tour the Project Site during the Work according to SP-6.

## GP-40 RECORDKEEPING

The Contractor shall maintain orderly records of the Progress Schedule, Daily Progress Report, Weekly Progress Meetings, correspondence, submittals, reproductions of original Contract Documents, Change Orders, Field Orders, certificates, additional drawings issued subsequent to the executed Contract, clarifications and interpretations of the Contract Documents by the Engineer, and other related documents at the Project Site until all of the Work is accepted by the Engineer.

## GP-41 CERTIFICATES OF COMPLIANCE

Any certificates required for demonstrating proof of compliance of materials with specification requirements shall be executed in three (3) copies. Each certificate shall be certified by an authorized agent of the supplying company and shall contain the name and address of the Contractor, the project name and location, and the quantity and date of shipment. Copies of laboratory test reports submitted with certificates shall contain the name and address of the testing laboratory and the testing date. Certification shall not be construed as relieving the Contractor from furnishing satisfactory material if the material is tested and determined to be in nonconformance.

## GP-42 MODIFICATIONS TO THE WORK

The Engineer may authorize modifications, additions or deductions to the Work using Change Orders, Field Orders or Written Amendments. The requirements and stipulations of these documents shall be binding on the Owner and Contractor throughout the remainder of the Contract.

## GP-43 ADJUSTMENT TO COMPENSATION

The Contractor shall submit a written Claim to the Engineer before starting any work which is believed to require additional compensation or an adjustment to the Contract Price. The Contractor shall justify the request for additional labor and materials in the Claim using appropriate data and calculations. The Engineer reserves the right to accept, deny, or negotiate the Claim. If the Claim is approved by the Engineer, a Change Order shall be issued to the Contractor. The Contractor shall waive any right to additional compensation if a Claim is not submitted in a timely or satisfactory manner. Nothing in this provision shall be construed as establishing any Claim contrary to the terms of GP-42.

## GP-44 INCREASE IN CONTRACT PRICE

The Contractor is expected to complete the Work according to the Contract Price specified in the Bidding Documents. A legitimate increase of the Contract Price may be claimed by the Contractor throughout the course of the Work. This Claim must be submitted to the Engineer in writing within fifteen (15) days of the event which caused the cost increase to the Contractor. The Contractor shall justify the increase of the Contract Price in the Claim using supporting data and calculations. The Engineer may deny the claim if there is insufficient information to make a determination. If the Claim is approved, the Engineer shall issue a Change Order within thirty (30) days of the Claim. The requirements and stipulations of Change Order shall be binding on the Owner and Contractor throughout the remainder of the Contract.

The increase in Contract Price shall be determined by the following:

- 44.1 By application of the unit prices in the Contract to the quantities of the items involved; or
- 44.2 By mutual acceptance between the Owner and Contractor of a lump sum.

If the Contractor is prevented from completing the Work within the Contract Price due to the Owner, the Contractor may be entitled to any reasonable and necessary addition of cost as determined by the Engineer. Neither the Owner nor the Contractor shall be entitled to any damages arising from events or occurrences which are beyond their control, including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God, acts of war, and other like matters. The provisions of this section exclude recovery for damages caused by the Contractor and compensation for additional professional services by either party.

## GP-45 EXTENSION OF CONTRACT TIME

The Contractor is expected to complete the Work within the Contract Time specified in the Bidding Documents. A legitimate increase of the Contract time may be requested by the Contractor throughout the course of the Work. This Claim must be submitted to the Engineer in writing within fifteen (15) days of the event which caused the time delay to the Contractor. The Contractor shall justify the increase of the Contract Time in the Claim using supporting data and calculations. The Engineer may deny the claim if there is insufficient information to make a determination. If the Claim is approved, the Engineer shall issue a Change Order within thirty (30) days of the Claim. The Contract Time shall be increased on a basis that is commensurate with the amount of additional or remaining Work. For example, the Contract Time can be increased where the number of actual adverse weather days exceeds the number of days anticipated in the Progress Schedule.

## GP-46 DEFAULT AND TERMINATION OF CONTRACT

The Owner shall submit a written notice to the Contractor and Surety which justifies placement of the Contractor in default if:

- 46.1 The Work is not begun within the time specified in the Notice to Proceed; or
- 46.2 The Work is performed with insufficient workmen, equipment, or materials to assure prompt completion; or

- 46.3 The Contractor performs unsuitable, neglected or rejected work, refuses to remove materials; or
- 46.4 The Work is discontinued; or
- 46.5 The Work is not completed within the Contract Time or time extension; or
- 46.6 Work is not resumed within a reasonable time after receiving a notice to continue; or
- 46.7 The Contractor becomes insolvent, or is declared bankrupt, or commits any act of bankruptcy or insolvency; or
- 46.8 The Contractor allows any final judgment to stand unsatisfied for a period of ten (10) days; or
- 46.9 The Contractor makes an assignment for the benefit of creditors; or
- 46.10 The Work is not performed in an acceptable manner.

If the Contractor or Surety does not comply within ten (10) days after receiving such a notice, the Owner shall remove the Contractor from the Work. If the Contractor is placed into default, the Owner may obtain the necessary labor, materials and equipment or enter into a new Agreement and Contract in order to complete the Work. All costs incurred by the Owner for completing the Work under the new Contract will be deducted from the payment due the Contractor. If the expense exceeds the sum payable under the Contract, the Contractor and Surety shall be liable to pay the Owner the difference.

#### **GP-47 TEMPORARY SUSPENSION OF WORK**

The Engineer shall have the authority to temporarily suspend the Work in whole or in part. A Field Order shall be issued to the Contractor for any of the Work that is suspended for periods exceeding one (1) calendar day. The Field Order shall include the specific reasons and details for the suspension. The Contract Time shall not be extended if the Work is suspended due to failure by the Contractor to comply with a Field Order or with the Plans and Specifications. If the Work is suspended in the interest of the Owner, the Contractor shall make due allowances for the lost time.

#### **GP-48 NON-CONFORMING AND UNAUTHORIZED WORK**

Work not conforming to the Plans, Specifications, Field Orders or Change Orders shall not be accepted or compensated. Unacceptable or unauthorized work shall be removed and replaced in an acceptable manner at the expense of the Contractor in order to obtain final acceptance of the Work.

#### **GP-49 CONTRACTOR'S RIGHT TO TERMINATE CONTRACT**

The Contractor may terminate the Contract or Work and recover payment from the Owner for labor and materials if the Work is stopped through no act or fault of the Contractor for more than three (3) months. For example, such an occurrence could be caused by a court order or other public authority. In any case, the Contractor shall submit a written notice to the Engineer at the beginning of the occurrence, and a written Claim to the Owner at the end of the occurrence.

#### **GP-50 BREACH OF CONTRACT**

The Owner shall submit a written Claim to the Contractor regarding any breach of the Contract. The Contractor must provide a written response to the Owner regarding the breach of Contract within 10 days after the Claim. This response must provide either an admission to the Claim or a detailed denial based on relevant data and calculations. The failure of the Contractor to provide a proper response within 10 days shall result in justification of the Claim by default.

## GP-51 NO WAIVER OF LEGAL RIGHTS

The Owner shall not be prevented from recovering costs from the Contractor, Surety or both due to failure of the Contractor to fulfill all of the obligations under the Contract. If a waiver is provided to the Contractor for a breach of Contract by the Owner, it shall not apply to any other breach of Contract. Final acceptance of the Work shall not prevent the Owner from correcting any measurement, estimate, or certificate. The Contractor shall be liable to the Owner without prejudice to the terms of the Contract or any warranty for latent defects, fraud or gross negligence.

## GP-52 LIABILITY FOR DAMAGES AND INJURIES

To the fullest extent permitted by Laws and Regulations, the Contractor shall indemnify and hold harmless the Owner, Engineer and their affiliates from claims, costs, losses, demands and judgments (including but not limited to fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs) caused by negligence of the Contractor or the Contractor's affiliates under this Contract, provided that it:

- 52.1 Is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property including the loss of use resulting there from; or
- 52.2 Is caused by negligence or omission of the Contractor or Subcontractors to furnish any of the Work in accordance with all Laws and Regulations.

The indemnification obligations of the Contractor shall not extend to the liability of the Owner, Engineer and their affiliates arising out of the preparation or approval the Plans, Specifications, maps, opinions, reports, surveys, Change Orders, or for providing directions or instructions which are the primary cause of the injury or damage.

Should the Owner or Contractor suffer from any injury or damage due to an error, omission, or act of the other party or their legally liable affiliates, a written Claim shall be submitted to the other party within 10 days. The Claim shall provide all details regarding the injury or damage, the results of any investigations, and the action to be taken to prevent any reoccurrence.

## GP-53 LIABILITY FOR LOSSES BY ACTS OF THE GOVERNMENT

The Owner shall not be liable for any loss or damage suffered by the Contractor arising out of a cessation of Work under this Contract due to any act or order of any local, state or federal government agency. If this cessation occurs, the Contractor may request an extension of the Contract Time according to the provisions in GP-45.

## GP-54 FINAL INSPECTION AND ACCEPTANCE

The Engineer, Owner and Contractor shall perform a final inspection after receiving written notice from the Contractor that all of the Work is complete. If the Work is determined to be unsatisfactory, the Engineer shall notify the Contractor in writing of the deficiencies and recommended corrective actions.

Unfulfilled work or damages caused by the negligence of the Contractor or Subcontractors shall be repaired or corrected at the expense of the Contractor. All other damages to the Work which received previous acceptance by the Engineer shall be repaired at the expense of the Owner. Upon completion of the repairs or corrections, the Engineer, Owner and Contractor shall perform another inspection. The Engineer shall submit a written notice of acceptance to the Owner after the Work has been determined to be satisfactorily completed according to the Contract.

## GP-55 AS-BUILT DRAWINGS

The Contractor shall submit the As-Built Drawings to the Engineer for review and acceptance in accordance with the approved progress schedule (GP-8). All originals and copies of the drawings shall be submitted according to TS-3. The As-Built Drawings shall provide complete data for quantities, dimensions, specified performance and design criteria, and similar items which clearly represent the services, materials, and equipment the Contractor has provided. All revisions shall be written in red ink and initialed by the Contractor.

## GP-56 COMPLETION OF CONTRACT

Completion of the Contract requires all of the Work to be complete, inspected by the Engineer, accepted by the Owner as recommended by the Engineer and after final payment is made. After the Contract is complete, the Contractor will then be released from further obligation except as set forth in the Contract Bond.

## GP-57 CONTRACTOR'S GUARANTEE

The Contractor is obligated to guarantee the Owner that all of the Work conforms to the Contract Documents. The Work shall be guaranteed to survive final payment as specified in the Contract Documents.

- 57.1 The guarantee shall exclude defects or damage caused by:
  - 57.1.1 Abuse or improper modification, maintenance or operation by anyone other than the Contractor; or
  - 57.1.2 Wear and tear under normal usage.
- 57.2 This obligation by the Contractor shall be absolute. The following actions will not constitute acceptance of non-conformance work or release the Contractor from obligation to furnish the Work in accordance with the Contract Documents:
  - 57.2.1 Observations by the Owner or Engineer; or
  - 57.2.2 Recommendations by the Engineer or payment by the Owner; or
  - 57.2.3 Use of the Work by the Owner; or
  - 57.2.4 Issuance of a notice of acceptance by the Owner pursuant to the provisions of GP-48, or failure to do so; or
  - 57.2.5 Any inspection, test or approval by others; or
  - 57.2.6 Any correction to non-conforming work by the Owner.

## **PART II SPECIAL PROVISIONS**

### **SP-1 LOCATION OF WORK**

The Project Site is located in St. Bernard Parish, Louisiana, on the southern shoreline of Lake Borgne near Bayou Dupre and Old Shell Beach. The Project Site is only accessible by boat from Lake Borgne. See Appendix D for directions to the available launches.

### **SP-2 WORK TO BE DONE**

The Contractor shall provide all labor, materials and equipment necessary to perform the Work. The Work shall include mobilization and demobilization at the Project Site, dredge access and flotation channels, construction of rock breakwaters, construction of a back-to-back steel sheet pile structure with a scour protection berm, and installation of permanent warning signs and settlement plates. The Work shall be performed in accordance with these Specifications and in conformity to lines, grades, and elevations shown on the Plans or as directed by Engineer.

The Work to be performed by the Contractor is further described as follows:

- 2.1 Surveying – Prior to construction, the transects that were established in the previous survey shall be resurveyed for bathymetry and topography. The existing temporary bench marks shall be verified or reinstalled if damaged. Settlement plates shall be surveyed during installation along the alignment of the rock breakwaters. All of the access routes to the Project Site, access and flotation channels, and the alignment of the rock breakwaters shall be surveyed by magnetometer. During construction, surveys for partial payment and quality control shall be performed as deemed necessary by the Contractor and as requested by the Engineer. After construction is complete, an As-Built Survey shall be performed for acceptance of all of the Work.
- 2.2 Dredging – Access channels shall be dredged to the Project Site to allow for delivery of construction materials by marine vessels. Additionally, flotation channels shall be dredged along the southern shoreline of Lake Borgne to allow marine vessels to construct the rock breakwaters.
- 2.3 Geogrid Composite – Geogrid Composite shall be installed underneath the rock breakwaters and the scour protection berm for the back-to-back sheet pile structure prior to placement of the rock breakwaters. It shall also be installed between the sand backfill and rock protection layers within the back-to-back sheet pile structure.
- 2.4 Rock Breakwater - A continuous rock breakwater shall be constructed approximately 6,609 feet to the west and 4,147 feet to the east of the back-to-back steel sheet pile structure at Bayou Dupre. A semi-continuous rock breakwater shall be constructed from Fort Bayou approximately 16,968 feet to Doullut's Canal near Old Shell Beach. The rock breakwaters shall be constructed parallel to the shoreline along the approximate +0.5 ft NAVD 88 contour according to the cross sections specified in the Plans, or as directed by the Engineer.
- 2.5 Sheet Pile Structure – A back-to-back steel sheet pile structure with layers of sand backfill, rock protection and geogrid composite, and a rock scour protection berm shall be constructed at the mouth of Bayou Dupre. The structure shall extend approximately 1,147 linear feet to the west and 452 linear feet to the east of the existing rock breakwaters at the mouth of Bayou Dupre.
- 2.6 Warning Signs – Permanent warning signs shall be installed along the lake ward side of the rock breakwaters every 1,000 ft.
- 2.7 Settlement Plates - Settlement plates shall be installed along the centerline of the rock breakwaters every 1,000 ft.

**SP-3 BID AND CONTRACT DATES**

<b>Milestone</b>	<b>Location or Recipient</b>	<b>Date Due</b>
Bid Advertisement	Publications	As advertised
Pre-bid Conference	Provided in Notice to Bidders	Provided in Notice to Bidders
Questions on Bid Documents	Deliver to Engineer	3 days after Pre-bid Conference
Site Visit	Provided in Notice to Bidders	Provided in Notice to Bidders
Effective Date of Agreement	Contractor and Owner	Stated in Notice of Award
Start of Contract Time	Contractor and Owner	As stated in Notice to Proceed
Work Plan	Submit to Engineer	At least 14 days prior to Pre-Construction Conference
Progress Schedule	Submit to Engineer	At least 14 days prior to starting construction, monthly thereafter
Pre-Construction Conference	Contractor and Engineer	As determined by the Engineer after the Notice to Proceed is issued
Weekly Progress Meeting	At Project Site	As determined at Pre-Construction Conference
As-Built Drawings	Deliver to Engineer	Within 2 weeks After End of Construction
End of Contract Time	At Project Site	500 days after Notice to Proceed

**SP-4 ADDRESSES FOR DOCUMENT DELIVERY**

The Contractor shall send all Bid documentation or questions to the attention of the Project Engineer. All Contract documentation or questions should be sent to the attention of the Field Engineer. The addresses and contact information for the Engineers are listed as follows:

Project Engineer  
 Shannon Haynes, P.E.  
 617 North 3rd Street  
 Suite 1036  
 Baton Rouge, Louisiana 70802

Field Engineer  
 George Boddie, P.E.  
 2045 Lakeshore Drive  
 CERM Building, Suite 309  
 New Orleans, Louisiana 70122

Phone: 225-342-9424  
 Fax: 225-342-6801

Phone: 504-280-4067  
 Fax: 504-280-4066

The Owner and Engineer shall deliver all written Claims, notices, submittals, Plans and other documents to the Contractor at the address indicated on the Bid.

**SP-5 WORK PLAN SUPPLEMENTAL**

The following items shall be included in the Work Plan in addition to those required by GP-8:

- 5.1 Layout and construction schedule for rock breakwaters and steel sheet pile structure;
- 5.2 Layout and schedule for temporary access and flotation channels;
- 5.3 Barge displacement table;
- 5.4 Rock staging area;
- 5.5 Geogrid composite layout.



## SP-6 TRANSPORTATION SUPPLEMENTAL

The Contractor shall provide a boat for the exclusive use of the Engineer and/or Inspector to tour the Project Site during the Work. The boat shall have the following features:

- 6.1 An enclosed cabin space;
- 6.2 Capable of maintaining 25 knots (29 mph);
- 6.3 Six (6) passenger capacity;
- 6.4 Coast Guard certified;
- 6.5 Operable marine radio;
- 6.6 All safety equipment required by the Coast Guard for the size and type of that boat;
- 6.7 Draft of two feet (2') or less.

The Contractor shall supply the fuel and maintain the boat. All mechanical malfunctions of the boat shall be repaired within twelve (12) hours. In the event that the Contractor refuses, neglects, or delays compliance with the requirements of this provision, the Owner may obtain and use other necessary boats at the expense of the Contractor. The costs associated with providing the boats shall be included in the lump sum price for Bid Item No. 1.

## SP-7 FAILURE TO COMPLETE ON TIME

For each day the Work remains incomplete beyond the Contract Time, as specified in SP-3, or Extension of Contract Time, as specified in GP-45, the sum of one-thousand and five-hundred dollars (\$1,500) per calendar day will be deducted from any money due to the Contractor as liquidated damages. The Contractor and Surety shall be liable for any liquidated damages that are in excess of the amount due the Contractor.

## SP-8 BARGE DISPLACEMENT TABLE

The Contractor shall develop a barge displacement table for measurement and payment of rock and include it in the Work Plan. The table shall be developed and stamped by an Engineer licensed in the state of Louisiana. It shall show the name and/or number, dimensions, name of owner, and name of fabricator for each barge. The Contractor shall furnish a dimensioned drawing or sketch of each barge that is sufficient enough to verify the barge displacement table. The drawings shall show, at a minimum, the length, width, and depth of the barge, and dimensions of rake(s). All new or modified barges shall be field checked for current dimensions by the Contractor in the presence of the Engineer or the Inspector. Each table shall contain the freeboard of the barge in feet and tenths from zero (0) to the full depth of the barge and the corresponding gross displacement to the nearest ton.

Each barge shall be suitably marked with two displacement gaging lines along each side of the barge. Each gaging line shall be painted perpendicular to the edge of the barge and be no less than four (4) inches wide and one (1) foot long on both the deck and side of the barge. Barges with rakes shall have the displacement gaging lines placed at each corner of the box section between the rakes. If a barge has a box end or ends, the gaging lines shall be placed approximately four (4) feet from the box end. The freeboard will be measured at the four (4) gaging locations and the displacement determined by the use of the "CELMV Standard Barge Tables" from the average of these measurements. The displacement shall be determined before and after the barge is unloaded and the difference between these values shall be the quantity delivered.

If the barge tables were originally furnished for fresh water and the barge displacement measurements are being taken in salt water, the Contractor has the option to obtain water samples and determine the densities or unit weights of the water. Water sampling shall be performed concurrently with the measurements of the barges, both when fully loaded and empty. Water samples shall be taken by the Contractor and witnessed by the Engineer. The water samples shall be taken in accordance with ASTM D 3370 (practice A-Grade Sample) at depths of four (4) and eight (8) feet in the area where measurements are made using a "Polypro" 2000 ml. water sampler, or approved equal.

Densities shall be tested by a certified testing laboratory according to ASTM D 1429 (Method D- Hydrometer Method). After review and approval of the test results by the Engineer, the average of the densities will be used to adjust the measurements. A unit weight of 62.45 pounds/cubic foot is standard for fresh water. If the Contractor does not obtain water samples and densities, then no adjustments will be applied to the displacement table and rock quantities.

#### **SP-9 OYSTER LEASE RESTRICTIONS**

Oyster leases are known to exist near or within the boundaries of the Project Site. The locations for the leases are provided in the Plans. The Owner has acquired those portions of the leases which exist within the boundaries of the Project Site. The oyster lease restrictions for performing the Work within the boundaries of the Project Site are provided in Appendix C.

#### **SP-10 THREATENED AND ENDANGERED SPECIES**

The Environmental and Biological Assessments for this project identifies Gulf Sturgeon and West Indian Manatees as threatened and endangered species which have the potential to exist within the boundaries of the Project Site. The Contractor shall review and comply with the restrictions in the Environmental and Biological Assessments regarding dredging and backfilling of the access and flotation channels. The Environmental and Biological Assessments are provided in Appendix C.

#### **SP-11 SPECIAL PERMIT CONDITIONS**

The Contractor shall notify the commander of the Eighth United States Coast Guard District as specified by the USACE Permit in Appendix C. A copy of the Plans and that permit shall also be provided to the commander as specified in the permit.

#### **SP-12 OFFICE FOR OWNER**

The Contractor shall provide an office for the Engineer and Inspector at the Project Site if requested by the Engineer. This office shall be for the sole use of the Engineer or Inspector, suitably sized, provided with lighting, heat, and air conditioning. The office furnishings shall include a work table, drafting table, stool, and two chairs.

In the event that the Contractor refuses, neglects, or delay compliance with the requirements of this provision, the Owner may obtain and use another necessary office at the expense of the Contractor. The cost for providing and furnishing this office shall be included in the contract lump sum price for Bid Item No. 1.

## **PART III TECHNICAL SPECIFICATIONS**

### **TS-1 GENERAL REQUIREMENTS**

- 1.1 **Scope:** The Contractor shall furnish all of the labor, materials and equipment necessary to excavate and backfill the access and flotation channels, construct the rock breakwaters and back-to-back steel sheet pile structure, and fabricate and install the warning signs and settlement plates as specified in the Plans and these Specifications. Quantity calculations, layouts, shop drawings, and construction sequencing of these items shall be provided in the Work Plan. The major tasks associated with the Work are described as follows:
  - 1.1.1 Dredge and maintain barge access and flotation channels along the southern shoreline of Lake Borgne within the Project Site. The channels shall be backfilled with the spoil material after construction of the rock breakwaters is complete. See TS-4 for the requirements of this item.
  - 1.1.2 Construct the back-to-back steel sheet pile structure and rock scour protection berm using steel sheet pile, steel walers, geogrid composite, and rock. The structure will extend approximately 1,147 linear feet to the west and 452 linear feet to the east of the existing breakwaters at the mouth of Bayou Dupre. The structure will also tie into the existing USACE rock breakwaters and new rock breakwaters proposed for this project. See TS-5, TS-9, TS-10, TS-11, TS-12, and TS-13 for the requirements of these items.
  - 1.1.3 Construct the rock breakwater sections near Bayou Dupre and Old Shell Beach utilizing geogrid composite and rock. From the back-to-back sheet pile structure at Bayou Dupre, continuous rock breakwaters will extend approximately 6,609 feet to the west along Reach 1 and 4,147 feet to the east along Reach 2. In the vicinity of Old Shell Beach, semi-continuous rock breakwaters will extend approximately 8,639 feet between Fort Bayou and Bayou Yscloskey along Reach 3, and approximately 8,329 feet between Bayou Yscloskey and Doullot's Canal along Reach 4. See TS-5 and TS-6 for the requirements of these items.
  - 1.1.4 Install settlement plates and warning signs along the rock breakwaters and back-to-back sheet pile structure at 1,000' intervals as shown in the Plans. See TS-7 and TS-8 for the requirements of these items.
- 1.2 **Disposal of Dredged Material:** Dredged material shall be deposited within the spoil areas shown on the Plans. Placement in any other location is prohibited without prior written approval from the Engineer. Logs, stumps, snags, debris and other obstructions which are encountered will not receive separate payment for removal and disposal.
- 1.3 **Use of Equipment:** The equipment used for the Work shall be operated within the boundaries of the Project Site and away from existing vegetated wetlands, the lake shoreline, or any other sensitive areas. Wheeled and tracked vehicles are only allowed within the marsh and open water areas which require end-on-construction as shown in the Plans. The Contractor shall be responsible for returning all disturbed wetlands to pre-existing conditions at no expense to the Owner.
- 1.4 **Navigation Depths:** Access and flotation channels shall be dredged and maintained to provide clear and safe navigation of all marine vessels to be used for the Work. Areas containing navigable depths shall not be impaired except as allowed by applicable laws or regulations. It is the responsibility of the Contractor to select equipment that can navigate from a maintained navigation channel to the Project Site without dredging except for the flotation and access channels depicted in the Plans. All equipment shall remain floating at all times during the transit to the Project Site. The Contractor shall obtain NOAA Nautical Charts and/or other charts to become familiar with the depths in the vicinity of the Project Site.

## TS-2 MOBILIZATION AND DEMOBILIZATION

- 2.1 Description: The Contractor shall provide all labor and equipment costs necessary to move personnel, equipment, supplies and incidentals to and from the Project Site, establish offices, buildings, and other facilities necessary for the Work, obtain bonds, required insurance and any other pre-construction expenses necessary to perform the Work. This section shall exclude the cost of construction materials.
- 2.2 Arbitrary Mobilization by Contractor: The Owner shall pay for only one mobilization and demobilization effort. Should the Contractor demobilize prior to completing the Work, subsequent remobilization shall be performed at no cost to the Owner.
- 2.3 Ratio of Mobilization and Demobilization Effort: Sixty percent (60%) of the mobilization/demobilization lump sum price will be paid to the Contractor upon complete mobilization to the Project Site. The remaining forty percent (40%) will be paid to the Contractor upon final acceptance of the Work.
- 2.4 Justification of Costs: The Contractor will be required to submit a written Claim to the Engineer if the cost of installation mobilization and demobilization is in unreasonable relation to the cost of the Work. The Engineer shall make a determination on the justification of the Claim. Failure to adequately justify this relation in the Claim shall result in payment of actual mobilization and demobilization costs as stated in this Section. The determination by the Engineer is not subject to appeal.
- 2.5 Measurement and Payment: The Contractor shall submit an Application for Payment for the costs incurred to mobilize and demobilize all equipment, personnel, and other such costs as denoted in the Contract Documents. Upon approval by the Engineer, invoices shall be paid for at the contract lump sum price for Bid Item No. 1. No invoice will be paid for mobilization until the flotation and access channels have been completed as defined in TS-4.6. No invoice will be paid for demobilization until the As-Built surveys have been accepted by the Engineer as required in TS-3.

## TS-3 SURVEYING

- 3.1 Scope: The Contractor shall furnish all of the materials, labor and equipment necessary to perform preconstruction, process and As-Built Surveys of the baseline, transects, rock breakwaters, sheet pile structure, settlement plates, and access and flotation channels as shown in the Plans. All surveys shall be performed by personnel who are approved by the Engineer under the direct supervision of a professional land surveyor licensed in the state of Louisiana. Survey data shall reference the North American Datum of 1983 (NAD 83), Louisiana South Zone, U. S. Survey Feet for horizontal control, and the North American Vertical Datum of 1988 (NAVD 88), U. S. Survey Feet for vertical control. Horizontal and vertical control shall be established by using the two LDNR secondary monuments specified in Appendix E.
- 3.2 Pre-Construction Survey: The baseline, transects and temporary benchmarks shown on the Plans shall be re-surveyed and staked by the Contractor after the Pre-Construction Conference and prior to construction. This survey shall be used to verify the alignment of the various project features and to make modifications or adjustments as deemed necessary by the Engineer. Drawings of the plan views and cross sections and calculations of the projected quantities of materials shall be developed from this survey by the Contractor.
  - 3.2.1 Temporary Bench Marks (TBM): TBMs Nos. 1 through 8 shall be re-installed as shown on the Plans and at any other locations necessary to complete all surveys. Horizontal and vertical coordinates shall be determined for all TBMs installed. The Contractor shall maintain the TBMs for the duration of the Work. In the event that a single TBM is disturbed and/or destroyed, the TBM may be reinstalled by qualified personnel as approved by the Engineer. If multiple TBMs are destroyed, the Engineer may require the TBMs to be reinstalled by a professional surveyor licensed in State of Louisiana. The TBMs shall be shown on the plan view drawings.
  - 3.2.2 Baseline: The baseline shall be surveyed and staked at all points of inflection and intersections with the transects. The baseline shall be shown on the plan view drawings.

- 3.2.3 Transects: The transects shall be surveyed from the baseline to a minimum of 25 feet onshore and 1,000 feet offshore at 25 foot intervals. For Station 85+00, the transects shall extend 250 feet beyond both sides of the baseline in order to capture the bathymetry of Bayou Dupre. No survey work shall be performed beyond Station 135+00 at Bayou Dupre due to the presence of existing cultural resource sites.

The transects shall also be surveyed and staked at all intersections with the alignment of the rock breakwaters and sheet pile structure, with the existing shoreline, with the inside and outside toes of the access and flotation channels, and with the baseline. The inflection points of the alignment of the rock breakwaters and steel sheet pile structure shall also be surveyed and staked.

The Contractor shall develop drawings which show the cross sections and plan views of the shoreline, rock breakwaters, access and flotation channels, and the sheet pile structure. Elevations, coordinates, lines and grades for each of these features shall all be shown on the drawings. Contours at elevations +1.0', 0.0', -1.0, -3.0', and -6.0' NAVD 88 shall also be shown on all plan view drawings.

The Contractor shall also determine the projected quantities for rock, geogrid composite, sand, steel sheet pile, and all sheet pile connections. The quantities of rock and sand shall be calculated using a method that is approved by the Engineer, such as the average end area or AutoCADD. The projected quantities of rock shall be calculated in tons and account for an in-place unit weight of rock equal to 1.5 tons per cubic yard and the assumed settled section (below existing ground) shown in the Plans. The projected quantity of steel sheet pile shall be calculated in square feet for both the 30 foot and 60 foot long sections.

- 3.2.4 Stakes: The stakes shall be untreated wood of sufficient diameter and length such that they are embedded at least three feet into the soil and protrude 5 feet above existing grade if on shore, or 5 feet above mean water elevation if off shore.

- 3.2.5 Magnetometer Survey: A magnetometer survey shall be performed along the centerline of the access route(s) to the Project Site, access channels, flotation channels, sheet pile structure, pipelines, and submerged portions of the rock breakwaters, where possible. Perpendicular track lines shall be run at 500 foot intervals and extend 25 feet beyond the outside edge of each of these proposed features, where possible. All pipelines shall also be probed and appropriately marked throughout construction according to United States Coast Guard Standards. The magnetometer survey shall show all track lines, coordinates, amplitudes, signature types, and signature widths of all hits. The survey shall also show the coordinates, top elevation and ground cover for all pipelines.

- 3.3 Process Surveys: The settlement plates, rock breakwaters, rock protection layer, scour protection berm, sand fill and steel sheet pile shall be surveyed during construction as follows:

- 3.3.1 Settlement Plates: The Contractor shall survey the settlement plates along each Reach (1, 2, 3 or 4) within one day after installation and daily thereafter until each rock breakwater lift along that Reach is accepted by the Engineer.

- 3.3.2 Rock Breakwaters: The "Strong" soil profile breakwaters on Reaches 2 (Alignment coordinates 18-34), 3 (Alignment coordinates 25-34) and 4 (Alignment coordinates 50-59) shall be surveyed on days 1, 14 and 28 after the lift has been placed along each of those Reaches. The "Weak" soil profile breakwaters on Reaches 1 (Alignment coordinates 1-9), 3 (Alignment coordinates 25-34) and 4 (Alignment coordinates 50-59) shall also be surveyed on days 1, 14 and 28 after the first and second lifts have been placed along each of those Reaches. The crown and both toes of the rock breakwaters shall be surveyed at 500 foot intervals and at all survey transects and points of inflection along the alignment. The Engineer shall determine if the lift on each Reach is to be accepted or modified based on these surveys. Those portions of breakwaters which are modified must also be resurveyed.

- 3.3.3 Rock Protection Layer: The rock protection layer on the back-to-back steel sheet pile structure shall be surveyed after placement. The elevations of the protection layer shall be obtained along the alignment of the back-to-back steel sheet pile structure on 50 foot intervals and at all points of inflection. The Engineer shall determine if the protection layer is to be accepted or modified based on this survey. Those portions of the rock protection layer which are modified must also be resurveyed.

- 3.3.4 Scour Protection Berm: The scour protection berm on the back-to-back steel sheet pile structure shall be surveyed after placement. Both sides of the crown and outside toe of the berm shall be surveyed along the alignment on 50 foot intervals and at all points of inflection. The Engineer shall determine if the berm is to be accepted or modified based on this survey. Those portions of the scour protection berm which are modified must also be resurveyed..
- 3.3.5 Sand Fill: The sand fill layer in the back-to-back steel sheet pile structure shall be surveyed after placement on days 1 and 30. The elevations of the sand fill shall be obtained along the alignment of the back-to-back steel sheet pile structure on 50 foot intervals and at all points of inflection. The Engineer shall determine if the sand fill layer is to be accepted or modified based on these surveys. Those portions of the sand fill layer which are modified must also be resurveyed..
- 3.3.6 Steel Sheet Piles: The steel sheet piles on the back-to-back steel sheet pile structure shall be surveyed after installation. The top and outside toe of the sheet pile shall be obtained along the alignment of the back-to-back steel sheet pile structure at each tie rod assembly and at all points of inflection. The Engineer shall determine if the steel sheet piles are to be accepted or modified based on these surveys. Those portions of the steel sheet piles which are modified must also be re-surveyed.
- 3.4 As-Built Surveys: The settlement plates, access and flotation channels, rock breakwaters, sand fill, scour protection berm, rock protection layer and steel sheet pile shall be surveyed by the Contractor after construction is complete. Final payment will not be received until the As-Built Survey and Work have been accepted by the Engineer.
  - 3.4.1 Settlement Plates: All of the settlement plates shall be surveyed after all of the rock breakwaters have been accepted by the Engineer.
  - 3.4.2 Access and Flotation Channels: The centerline of all access and flotation and flotation channels shall be surveyed at 500 foot intervals and at all transects and points of inflection along the alignment. The survey shall also extend 25 feet beyond the outside edge of the access and flotation channels and temporary spoil areas.
  - 3.4.3 Rock Breakwaters: The final process surveys for rock breakwaters on those Reaches that are accepted by the Engineer shall be incorporated into the As-Built Survey
  - 3.4.4 Sand Fill: The final process survey for the sand fill layer that has been accepted by the Engineer shall be incorporated into the As-Built Survey.
  - 3.4.5 Scour Protection Berm: The final process survey for the scour protection berm that has been accepted by the Engineer shall be incorporated into the As-Built Survey.
  - 3.4.6 Rock Protection Layer: The final process survey for the rock protection layer that has been accepted by the Engineer shall be incorporated into the As-Built Survey.
  - 3.4.7 Steel Sheet Pile: The final process survey for the steel sheet piles that has been accepted by the Engineer shall be incorporated into the As-Built Survey.
- 3.5 Deliverables: The pre-construction, process and As-Built Surveys shall be stamped by a professional surveyor licensed in the State of Louisiana. The Contractor shall provide the details for the survey layout and stakeout in the Work Plan.

The pre-construction survey drawings and projected material quantities shall be submitted to the Engineer for review and approval prior to construction. Three copies shall be provided on 11" X 17" paper and one digital copy provided in AutoCAD or an approved equal.

The process survey drawings, in-place material quantities and supporting calculations shall be submitted to the Engineer for review immediately after they are performed in order to receive acceptance and payment. Three copies shall be provided on 11" X 17" paper and one digital copy provided in AutoCAD or an approved equal.

The As-Built Survey and in-place material quantities shall be submitted to the Engineer after construction is complete in order to receive acceptance and final payment. Three copies shall be provided on 11" X 17" paper and one digital copy provided in AutoCAD or an approved equal. The survey shall incorporate all field changes, change orders, and quantities of materials placed. All revisions shall be shown in red and be easily distinguishable from the original design.

Point files of the pre-construction, process and As-Built Surveys shall be included in the digital copies and shall contain the following information:

- 3.5.1 Point number;
  - 3.5.2 Northing (NAD 83 US. FT.);
  - 3.5.3 Easting (NAD 83 US. FT.);
  - 3.5.4 Elevation (NAVD 88 FT.);
  - 3.5.5 Description.
- 3.6 Measurement and Payment: The Contractor shall submit an Application for Payment for the costs incurred to perform the pre-construction, process and As-Built Surveys and other such costs as denoted in the Contract Documents. Upon acceptance by the Engineer, an invoice shall be paid for at the contract lump sum price for Bid Item No. 2.

#### TS-4 ACCESS AND FLOTATION CHANNELS

- 4.1 Scope: The Contractor shall furnish all of the materials, labor and equipment necessary to construct the access and flotation channels through removal and temporary disposal of spoil materials. The channels shall be maintained in a useable configuration throughout the duration of the Work at the expense of the Contractor. Boring logs for the Project Site are provided in Appendix F.
- 4.2 Excavation Method: The access and flotation channels shall be mechanically excavated using a bucket dredge, barge mounted track hoe or approved equal. The Contractor shall use any environmentally acceptable method that will complete the Work in accordance with the drawings. The proposed dredging method must be provided in the Work Plan.
- 4.3 Excavation Limits: Access and flotation channels shall not be excavated beyond the limits and coordinates shown on the Plans without written approval from the Engineer. The minimum bottom elevation of the channels shall be -6.0' NAVD 88 (i.e. the invert of the channel shall not be lower than -6.0' NAVD 88). The maximum turning radius for transitions between access and flotation channels is 250.0 feet. The locations of the LDNR permitted channels are shown in the Plans. It shall be the responsibility of the Contractor to obtain an LDNR permit modification and prior approval from the Engineer in order to enlarge or relocate the channels. The Contractor shall also obtain and submit to the Engineer a letter of no objection from any pipeline company for the proposed excavation inside their right-of-way.

- 4.4 Spoil Disposal: Dredged material shall be temporarily deposited lake ward of the access and flotation channels and conform to the elevations, grades, and lines specified in the Plans. It shall not be deposited outside of the limits shown on the Plans without written approval from the Engineer. The temporary spoil shall be backfilled into the flotation channel after the rock breakwaters have been accepted by the Engineer. The soils underneath the temporary spoil placement areas shall be reworked to  $\pm 6"$  of the original bottom. Any material that is deposited elsewhere than indicated on the Plans or as authorized by the Engineer shall be removed and deposited in an approved location at the expense of the Contractor.
- 4.5 Maintenance: The access and flotation channels shall be maintained according to the dimensions shown on the Plans in order to transport equipment and materials to the Project Site throughout construction. Maintenance excavation shall be performed at the expense of the Contractor.
- 4.6 Measurement and Payment: The Contractor shall submit an Application for Payment for the costs incurred to construct and maintain the flotation and access channels as denoted in the Contract Documents. The Engineer shall review the final elevation of the backfilled channels on the As-Built Survey in order to determine acceptance. Upon acceptance by the Engineer, an invoice shall be paid for at the contract lump sum price for Bid Item No. 3. No invoice will be paid for demobilization until the temporary spoil is successfully backfilled into the access and flotation channels and the bottom depth of the temporary disposal area is restored to within  $\pm 6"$  of the original bottom depth.

## TS-5 GEOGRID COMPOSITE

- 5.1 Scope: The Contractor shall furnish all of the materials, labor and equipment necessary to construct, install and maintain the geogrid/geotextile system (henceforth called the geogrid composite) until the rock breakwaters are completed and accepted according to the Plans and these Specifications.
- 5.2 Materials: The geogrid composite shall be a grid structure manufactured of a stress resistant polypropylene material, placed on top of a woven, geotextile which meets the physical property requirements listed in the tables below. The geogrid composite is formed by a regular network of integrally connected tensile elements with geogrid apertures of sufficient size to allow interlocking with surrounding soil, rock, and earth, and function primarily as separation (geotextile) and reinforcement (geogrid). The geogrid composite shall also possess the following characteristics:
- 5.2.1 A molecular weight and characteristics which impart high resistance to loss of load capacity or structural integrity when subjected to mechanical stress during installation;
- 5.2.2 A high resistance to deformation when subjected to applied force in use;
- 5.2.3 A high resistance to loss of load capacity or structural integrity when subjected to long-term environmental stress;
- 5.2.4 Shall accept applied force in use by positive mechanical interlock with the rock breakwaters, contiguous sections of itself when overlapped and embedded by the rock breakwaters, and connected with braided connectors (or acceptable equivalent, excluding bodkins);
- 5.2.5 A sufficient cross sectional profile to present a substantial abutment interface between the existing soil and rock breakwaters and to resist movement relative to those materials when subject to the applied force;
- 5.2.6 A sufficient flexural rigidity to help maintain intimate contact with the existing very soft to soft soils after the rock breakwaters are placed on top;
- 5.2.7 A sufficient true initial modulus to cause applied force to be transferred to the geogrid at low strain levels without material deformation of the reinforced structure;
- 5.2.8 Complete continuity of all properties throughout its structure and shall be suitable for use with the rock breakwaters in the coastal environment and improve the long-term stability of the rock breakwaters.



Physical Property (Geogrid)	Units	MD Values <sup>1</sup>	XMD Values <sup>1</sup>
Aperture Dimensions <sup>2, 10</sup>	(in)	1.6	
Percent Open Area (COE CW-02215)	%	62	
True Initial Modulus In Use <sup>3</sup>	(lb/ft)	32,900	
Ultimate Tensile Strength <sup>3</sup>	(lb/ft)	1575	
Elongation at Ultimate Tensile Strength <sup>3 *</sup>	% *	12.5	12.0
True Tensile Strength @ 2% Strain <sup>3</sup>	(lb/ft)	450	
True Tensile Strength @ 5% Strain <sup>3</sup>	(lb/ft)	820	
Long Term Design Strength <sup>4, 10</sup>	(lb/ft)	360	
Junction Efficiency <sup>5</sup>	%	90	
Flexural Stiffness <sup>6</sup>	mg-cm	750,000	
Seam <sup>7, 11</sup>	(lb/ft)	945	
Resistance to Installation Damage <sup>8, 10</sup>	%SC & %GP	90 & 70	
UV Resistance (at 500 hours per ASTM D 4355)	%	80	
Resistance to Long Term Degradation <sup>9, 10</sup>	%	90	

**Notes**

1. Unless otherwise stated, minimum average roll values are determined in accordance with ASTM D-4759. Cross Machine Direction (XMD) properties are equal to or greater than the Machine Direction (MD) properties unless otherwise noted. The \* notation designates a Maximum Average Roll Value.
2. Minimum Nominal dimensions measured via caliper.
3. True resistance to elongation when initially subjected to a load measured by ASTM D6637 without deforming test materials under load before measuring such resistance or employing “secant” or “offset” tangent methods of measurement so as to overstate tensile properties.
4. Long Term Design Strength (LTDS) per GRI-GG4(a) or GRI-GG4(b), as appropriate for slopes in contact with riprap.
5. Load transfer capability measured via GRI-GG2 (1987) in lb/ft.
6. Resistance to bending force measured via ASTM D-1388, Option A, using specimen dimensions of 864 millimeters in length by 1 aperture in width. Note that multiple layer products shall be layered so the aperture open dimensions are maintained during initial laying out of the geogrid in the field.
7. The seam connecting adjacent sections of geogrid shall be constructed using continuously stitched seams using a Double Stitch Seam Using Braid with a maximum stitch spacing of about 2 inches near the center of the overlap. The braid material shall be securely knotted with a half-hitch knot to the grid at all ends of the seams, and at a spacing not to exceed 5 feet along any seam to resist raveling of the braid material. Braids shall be sufficiently durable, strong and taut to transmit a minimum of 60% of the Ultimate Tensile Strength and shall meet or exceed supplier recommendations for this application. The braid used for tying and lacing in the fabrication of the units shall be 8-strand hollow-core braid composed of high density polyethylene (HDPE). Each strand shall consist of a bundle of monofilament HDPE. The braid shall have a nominal diameter of not less than 3/16 inch and a breaking strength of not less than 400 lbs on a test specimen 36 inches in length. The braid shall be UV stabilized with a minimum carbon black content of 2.0% by weight.
8. Resistance to loss of load capacity or structural integrity when subjected to mechanical stress in installation measured via ASTM D-5818 in clayey sand, well graded sand, and crushed stone classified as poorly graded gravel with a maximum 2 inch particle size.
9. Resistance to loss of load capacity or structural integrity when subjected to chemically aggressive environments measured via EPA 9090 immersion testing. Applies to the geogrid and seam materials.
10. Minimum value in the event insufficient data exists to establish the MARV.

Physical Property (Geotextile)	Units	MD Values <sup>1</sup>	XMD Values <sup>1</sup>
Grab Tensile Strength (ASTM D-4632)	Lbs	450	350
Grab Elongation (ASTM D-4632)*	% *	15	15
Mullen Burst (ASTM D-3786)	psi	1000	
Long Term Design Strength (GRI-GT7)	Lb/ft	890	
Wide Width Tensile Strength (ASTM D-4595)	Lb/ft	3600	
Wide Width Tensile Strength @ 5% Strain (ASTM D-4595)	Lb/ft	1390	1740
Wide Width Elongation (ASTM D-4595)*	%	15	10
Puncture Strength (ASTM D-4833)	Lbs	180	
Trapezoidal Tear (ASTM D-4533)	Lbs	180	170
Percent Open Area (COE CWO-02215)	%	10-12	
Apparent Opening Size (AOS) (ASTM D-4751)*	US Sieve*	30 or 0.6 mm	
Permittivity (ASTM D-4491)	Sec <sup>-1</sup>	0.15 min	
Flow Rate (ASTM D 4491)	(gal/min/ft <sup>2</sup> )	10 to 30	
Seam Strength (ASTM D-4884)	Lb/ft	2400	
Strength Retained (500 hours) (ASTM D-4355)	%	80	

**Notes**

1. Unless otherwise stated, minimum average roll values are determined in accordance with ASTM D-4759. Cross Machine Direction (XMD) properties are equal to or greater than the Machine Direction (MD) properties unless otherwise noted. The \* notation designates a Maximum Average Roll Value.
2. The material shall be a woven geotextile consisting only of long chain polymeric filaments or yarns formed into a stable network such that the filaments or yarns retain their position relative to each other during handling, placement, and throughout the design service life. At least eighty-five (85) percent, by weight, of the material shall be polypropylenes, polyesters, polyamides, polyethylene, or polyolefins. The geotextile shall be free of any treatment or coating which might adversely alter the geotextile's hydraulic or physical properties after installation. When required, the geotextile fabric shall contain stabilizers and/or inhibitors added to the base material to make filaments resistant to deterioration due to ultraviolet light and/or heat exposure. The edges of the geotextile shall be selvaged. The geotextile shall be free from defects and tears and shall meet or exceed the physical property requirements listed in Table 2. Thread used for factory or field sewing shall be of contrasting color to the fabric and made of kevlar, polypropylene, polyester, or polyamide thread. The thread shall be as resistant to deterioration due to ultraviolet light and/or heat exposure.

- 5.3 **Shipment and Storage:** The geogrid composite shall be shipped in roll form with each roll individually identified and maintained in a protective cover(s) prior to placement. It shall be rejected during installation if defects, rips, flaws, deterioration or damage occurred during manufacture, transportation, or storage. During shipment and storage, it shall be protected from moisture, dust, debris, ultraviolet light, and other contaminants following the guidelines of ASTM D 4873. Each roll shall be labeled or tagged with the manufacturer's name, product identification, shipping lot, roll number, roll dimensions, roll weight, and date of manufacture.
- 5.4 **Warranty:** The manufacturer(s) shall warrant the geogrid composite components against manufacturing defects and material degradation under buried outdoor exposure for a period of 20 years on a prorated basis from the date of final payment and acceptance. Manufacturer shall repair or replace, at no expense to the Contractor, any material that fails from the previously mentioned causes within the warranty period. The Contractor shall furnish the Engineer with the written warranty from the Manufacturer.
- 5.5 **Submittals:** Manufacturing Certificate: All geogrid composite and mechanical connections used in construction will be accepted on the following basis. At least thirty (30) days prior to installation, the Contractor shall furnish to the Engineer, in duplicates, a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the materials. The certificate shall contain the signer's title, the name and address of the Contractor, the contract number, and the project name and location. The mill certificate or affidavit shall attest that the materials meet the chemical, physical, and manufacturing requirements in this specification. Accompanying the certificate/affidavit, the Contractor shall submit a three (3) foot by three (3) foot sample of the geogrid composite to the Engineer. An additional three (3) foot by three (3) foot sample containing mechanical

connectors in the center of the sample shall be submitted to the Engineer. Provide manufacturer's recommendations for installation and protection instructions for the project considering the foundation soil conditions and the rock dike materials.

- 5.6 **Panel Connections:** A panel of the geogrid composite shall consist of multiple strips of geotextile connected by sewing with Kevlar sewing thread (or polypropylene, polyester, or polyamide thread as recommended by the manufacturer for the application) with a minimum five (5') feet overlap overlain by geogrid elements with a minimum four (4') feet overlaps which are mechanically connected together by Double Stitch Seam Using Braid to achieve 60% or greater of the Ultimate Tensile Strength as noted in Table 1 (also see note 8). The thread shall be as resistant to deterioration due to ultraviolet light and/or heat exposure as the geotextile. The seams shall be capable of transmitting the maximum shear stress and tensile stresses, with an adequate factor of safety as recommended by the manufacturer. The seams shall consider the forces transmitted by the rock described in TS-6, and as shown on the contract drawings, when the seam connecting the geogrid composite rest on the very soft ground conditions depicted in the contract boring logs. The panel width must cover the minimum structure width shown on the plans and shall extend beyond the structure edge by three (3') feet on each side. Payment shall be based on the footprint depicted on the drawings, excluding overlap, and no payment will be made for material placed outside of the edge extension stated above.
- 5.7 **Geotextile Seams and End Laps:** A woven geotextile panel shall consist of multiple geotextile strips sewn together at the factory for as large a panel area as manageable. All geotextile panel seams shall be sewn at the factory using a double row, "butterfly" two-thread ("401") chainstitch. Each row of stitching shall be located a minimum of two (2) inches from the geotextile edge. The sewing shall consist of two parallel stitched rows at a minimum spacing of one (1) inch. The panel width must cover the minimum structure width shown on the plans and shall extend beyond the structure edge by three (3') feet on each side. Edges of geotextile fabric shall be finished to prevent outer yarn from pulling away from the fabric. Payment shall be based on the footprint depicted on the drawings, excluding overlap, and no payment will be made for material placed outside of the maximum edge overlap stated above. Each geotextile panel end lap shall be overlapped a minimum of five (5) feet to provide the area coverage shown on the plans. In areas deemed necessary by the engineer, the geotextile shall be overlapped a minimum of ten (10) feet or as directed by engineer.
- 5.8 **Panel Layout:** The Contractor shall include a panel layout in the Work Plan. The Contractor shall allow the Engineer a minimum of seven days for review and approval prior to fabrication of the geogrid composite panels.
- 5.9 **Installation:** The geogrid composite shall be placed in continuous panels below and parallel to the centerline of the rock breakwater as shown on the Plans. The geogrid composite shall extend beyond the toe of the breakwater by approximately 3 feet on both sides. Adjacent rolls of geogrid element of the geogrid composite shall have a minimum four (4') feet overlap to maintain alignment during placement of the rock. Care shall be taken to ensure that geogrid composite sections do not separate during construction. All wrinkles and sags shall be stretched out immediately before rock is placed on the geogrid composite. To immediately mobilize tensile forces in the geogrid composite, the edges of the geogrid composite rock footprint shall be "tacked" with a line of rock before proceeding with placement of rock across the full width of the geogrid composite footprint. The Work shall be scheduled so that it is completely covered with a layer of the rock by the end of each workday and failure to do so shall require replacement of geogrid composite.
- 5.9.1 The woven geotextile fabric shall be placed with the machine direction perpendicular to the rock dike centerline under the geogrid at the locations, and to the lines and grades shown on the plans. The Contractor shall prepare the surface to receive the geogrid composite, insuring the surface is relatively smooth and free of obstructions, depressions, debris, soft or low density pockets of material, and stone, which could damage the geogrid composite during placement. At the time of installation, the geogrid composite shall be rejected if defects, rips, holes, flaws, deterioration or damage incur during manufacture, transportation, or storage. The geogrid composite shall be protected at all times during construction to insure the geogrid composite's original chemical and physical properties are unchanged. Work shall be scheduled so that the geogrid composite placed, is completely covered with a layer of the specified material by the end of each workday. Failure to comply shall require replacement of geogrid composite. All wrinkles and sags shall be stretched out immediately before stone is placed on the geogrid composite.

- 5.9.2 The geogrid composite shall be protected from damage during placement of stone. This shall be accomplished by limiting the height of drop to less than one (1) foot for the first lift. In the event the stone placement damages the geogrid composite, the stone shall be placed directly on the geogrid composite with zero (0) height of drop. Before placement of stone, the Contractor shall demonstrate the stone placement will not damage the geogrid composite. Any geogrid composite rejected or damaged shall be replaced by the Contractor at no additional cost to the Owner. The Contractor shall also submit a geogrid composite panel placement plan for each site and the corresponding factory sewn panel dimensions. The Contractor shall allow the Engineer a minimum of seven days for review and approval of the placement plan, prior to geogrid composite fabrication.
- 5.9.3 Tracked construction equipment shall not be operated directly on the geogrid composite. A minimum rock thickness, as recommended by the manufacturer based on the foundation soils, shall be required prior to operation of tracked or rubber-tired vehicles over the geogrid composite. Turning of tracked vehicles shall be kept to a minimum to prevent tracks from displacing the rock and damaging the geogrid composite.
- 5.10 Damages and Repairs: The geogrid composite shall be protected at all times to insure the original chemical and physical properties. The Contractor shall check the geogrid composite upon delivery to verify that the proper materials have been received. Damaged geogrid composite shall be either removed and replaced or covered with a second layer of geogrid composite which extends three (3) feet in each direction from the damaged area. Any geogrid composite that is rejected or damaged due to the fault or negligence of the Contractor shall be repaired or replaced at no additional cost to the Owner.
- 5.11 Acceptance: The geogrid composite and all seams used in construction will be accepted on the following basis. At least thirty (30) days prior to installation, the Contractor shall furnish to the Engineer, in duplicates, a mill certificate or affidavit signed by a legally authorized official from the company manufacturing the elements of the geogrid composite. The certificate shall contain the signer's title, the name and address of the Contractor, the contract number, and the project name and location. The mill certificates or affidavits shall attest the geogrid composite elements meet the chemical, physical, and manufacturing requirements stated above in this specification, and the seams used to meet the seam requirements. Accompanying the certificates/affidavits, the Contractor shall submit the samples of each element of the geogrid composite to be used. If seams are used, additional samples containing a seam in the center of the element of the geogrid composite sample shall be submitted.
- 5.12 Measurement and Payment: The Contractor shall submit an Application for Payment for the costs incurred to construct and maintain the geogrid composite as denoted in the Contract Documents. The geogrid composite will be measured in place to the nearest square yard as shown on the Plans. Overlaps will be measured as a single layer. Price and payment shall constitute full compensation for providing all plant, labor, material, and equipment and performing all operations necessary for the complete and satisfactory installation of the geogrid composite. No payment shall be made for geogrid composite that is rejected or damaged due to Contractor fault or negligence. Upon acceptance by the Engineer, an invoice shall be paid at the applicable contract unit price for Bid Item No. 4.

## TS-6 250 LB CLASS ROCK

- 6.1 Scope: The Contractor shall furnish all of the materials, labor and equipment necessary to construct the “Weak” and “Strong” soil profile rock breakwaters, scour protection berm and rock protection layer in conformity to the lines, grades and thicknesses provided on the Plans and in these Specifications, or as directed by the Engineer. Only one lift shall be constructed along the “Strong” soil profile breakwaters. Two lifts shall be constructed along the “Weak” soil profile breakwaters due to rapid near term settlement. The “Strong” soil profile breakwaters shall be constructed along all of Reach 2, a portion of Reach 3 (Alignment Coordinates 25-34), and all of Reach 4. The “Weak” soil profile breakwaters shall be constructed along all of Reach 1 and a portion of Reach 3 (Alignment coordinates 25-34). The boring logs for the Project Site are provided in Appendix F.

6.2 **Materials:** The rock shall not disintegrate upon exposure to the elements or be easily broken from handling, and shall be reasonably free from earth and other foreign materials. When tested in accordance with AASHTO Designation: T 85, the solid weight of rock shall be at least one hundred and fifty (150) pounds per cubic foot (based on bulk specific gravity) and the absorption shall not exceed two percent (2%). The least dimension of an individual rock shall be at least one third (1/3) its maximum dimension.

6.3 **Quarries:** On the basis of information and data available to the Engineer, rock which meets the quality requirements of this specification is produced by the sources listed in the following table.

<b>Producer</b>	<b>Nearest Town to</b>	<b>Pit Designation</b>
B.E. Construction Co.	Murfreesboro, AR	Murfreesboro Quarry
Boorhem Fields, Inc.	Black Rock, AR	Valley Stone Quarry
Bussen Quarries, Inc.	Mehlville, MO	Bussen Quarry
Central Stone Co.	Withers Mill, MO	Pitt No. 1
Central Stone Co.	Perry, MO	Pitt No. 9
Central Stone Co.	Danby, MO	Plattin Quarry
Dravo Basic Material Co., Inc.	Smithland, KY	Three Rivers Quarry
Farmer=s Limestone Co.	Uniontown, MO	Farmer=s Limestone Quarry
Graysonia Quarries, Inc.	Delight, AR	Delight Quarry
H.M.B. Construction	Dequeen, AR	H.M.B. Quarry
Industrial Mineral Products	Little Rock, AR	3M Arch Street Quarry
Little Rock Quarry Co., Inc.	Caddo Valley, AR	DeRock Creek Quarry
Little Rock Quarry Co., Inc.	Little Rock, AR	Little Rock Quarry
McGeorge Corp.	Sweet Home, AR	Granite Mountain Quarry
Pine Bluff Sand and Gravel	Delaware, Ark.	River Mountain Quarry
Reed Crushed Stone Co.	Lake City, KY	Givertsville Quarry
Rigsby-Barnard Quarry, Inc.	Cave-In-Rock, IL	Rigsby-Barnard Quarry
Tower Rock Stone Co.	St. Genevieve, MO	Tower Rock Stone Quarry
Vulcan Materials Co.	Tuscumbia, AL	Quarry No. 114
Vulcan Materials Co.	Iuka, MS	Iuka Plant
West Lake Quarry Materials	Scott City, MO	Gray=s Point Quarry
West Lake Quarry Materials	Neely=s Landing,	Neely=s Landing Quarry
West Lake Quarry Materials	Barnhart, MO	Barnhart Quarry
West Lake Quarry No. 2	Musicks Ferry,	West Lake Quarry

Other rock supplies may be accepted prior to construction by the Engineer. In order to gain acceptance, the Contractor shall obtain and test samples of the rock for gradation under the supervision of the Engineer. The Engineer shall accept the rock if the test results comply with this specification.

6.4 **Gradation:** All rock shall be LADOTD Class 250 lb. graded rip-rap as specified by Section 711.02 (a) of the Louisiana Standard Specifications For Roads and Bridges, latest Edition or Owner approved equivalent. The rock shall meet the following gradation:

<b>Stone Size (lbs.)</b>	<b>Spherical Diameter (ft)</b>	<b>% of Stone Smaller Than</b>
1250	2.50	100
500	1.83	45-100
250	1.46	15-50
80	1.00	0-15

Control of gradation will be by visual inspection either at the source, or Project Site or both. The Engineer reserves the right to verify the gradation of any shipment by testing two uniform size random samples. The equipment, labor and cost for testing the samples shall be provided by the Contractor.

- 6.5 Free Fall: The rock shall be placed carefully onto the geogrid composite by limiting the height of drop to less than one (1) foot. If this height of drop causes damage to the geogrid composite, the stone shall be placed directly onto the geogrid composite with a zero (0) height of drop. Before placement of stone, the Contractor shall demonstrate to the Engineer that the stone will not damage the geogrid composite.
- 6.6 Losses: The Contractor is responsible to reclaim and utilize all rock that is lost during shipment or construction.
- 6.7 Placement of the Rock Breakwaters: All lifts for the “Strong” and “Weak” soil profile breakwaters shall be constructed according to the lines, grades and elevations specified in the Plans and these Specifications. The single lift for the “Strong” soil profile breakwaters shall be constructed to elevation +4.0’ NAVD 88. The first lift for the “Weak” soil profile breakwaters shall be constructed to elevation +3.0’ NAVD 88. The first lift shall be allowed to settle due to consolidation of the soils for a minimum of 30 days. After the first lift is accepted by the Engineer, the second lift shall be constructed to elevation +3.25’ NAVD 88. The rock shall be placed approximately three feet from each edge on top of the geogrid composite and worked toward the center.
- 6.8 Placement of the Rock Protection Layer: The rock shall be placed into the center of the sheet pile structure on top of the geogrid composite and worked towards the outside to the elevation shown in the Plans. The rock shall be dropped between the tie rod assemblies and then worked underneath, around, and on top of the assemblies. Rock shall not be dropped on or near the tie rod assemblies. Rock shall not be placed on top of the geogrid structure until the underlying sand fill has been accepted.
- 6.9 Placement of the Rock Scour Protection Berm: The rock berm shall be placed along the outside perimeter of the sheet pile structure according to the lines, grades, and dimensions shown on the Plans. The rock berm shall be constructed concurrently with the sand fill layer and before the rock protection layer is placed on the sheet pile structure
- 6.10 Equipment: The Contractor shall provide a proposed list of equipment in the Work Plan which will be used to construct the rock breakwaters, protection layer and scour protections berm. This list shall include the type (Drag Bucket, etc.), number of each type, and capacity (Cubic Yards, etc.) of the equipment.
- 6.11 Staging Area: The Contractor is responsible for locating a staging area with adequate depth to light load the rock barges. The Contractor shall include the proposed location of the staging area in the Work Plan. If the Staging area is within 150 feet of a well head or pipeline, they shall be probed and appropriately marked by the Contractor. The Contractor shall also submit any letters of no objection or agreements for temporary easements from the landowner, well owner, or pipeline owner to the Engineer.
- 6.12 Tolerances: The rock breakwaters, scour protection berm and rock protection layer shall be placed according to the cross sections (Elevations, slopes, dimensions, etc.) shown on the Plans with a maximum tolerance of plus or minus half a foot ( $\pm 0.5'$ ). The maximum tolerance shall not be continuous along the alignment over a distance greater than 200 feet. The average tolerance measured for each type of rock breakwater profile (I.E. “Strong” or “Weak”) and/or lift across the entire alignment shall be within 50 percent of the specified tolerance. Any stone placed outside of the specified tolerances will not be paid for by the Owner and must be added or removed by the Contractor.
- 6.13 Acceptance: Acceptance of the rock breakwaters, rock protection layer and scour protection berm shall be achieved as follows:

- 6.13.1 Rock Breakwaters: Each lift along Reaches 1, 2, 3 or 4 shall be accepted by the Engineer if it achieves compliance with the lines, grades, elevations, and tolerances in the Plans and these Specifications. Compliance shall be based upon the surveys performed 28 days after placement of each lift. The Engineer may require the Contractor to remove rock or place additional rock as necessary in order to achieve compliance. The first lift of the “Weak” soil profile breakwaters is required to be accepted prior to placement of the second lift.
- 6.13.2 Rock Protection Layer: The rock protection layer shall be accepted by the Engineer if it achieves compliance with the lines, grades, elevations, and tolerances in the Plans and these Specifications. Compliance shall be based upon the survey of the rock protection layer. The Engineer may require the Contractor to remove rock or place additional rock as necessary in order to achieve compliance.
- 6.13.3 Scour Protection Berm: The scour protection berm shall be accepted by the Engineer if it achieves compliance with the lines, grades, elevations, and tolerances in the Plans and these Specifications. Compliance shall be based upon the survey of the scour protection berm. The Engineer may require the Contractor to remove rock or place additional rock as necessary in order to achieve compliance.
- 6.14 Measurement and Payment: The Contractor shall submit an Application for Payment on a monthly basis provided that those Reaches of the rock breakwaters, rock protection layer, or scour protection berm have been completed within the acceptable tolerances and gained acceptance from the Engineer. The unit of measurement for rock shall be the ton (2,000 pounds). Quantities will be computed to the nearest whole ton using the Barge Displacement Table as specified in SP-8. The Contractor shall provide the Engineer with certified weight tickets issued by the stone quarry for each barge. The Contractor shall measure the weight of the rock by barge displacement prior to unloading any rock from the barge. The Engineer will verify this measurement prior to payment. Upon acceptance by the Engineer, an invoice shall be paid at the applicable contract unit price for Bid Item No. 5. No payment will be made for any unauthorized or non-conforming placement of the rock.

## TS-7 SETTLEMENT PLATES

- 7.1 Scope: The Contractor shall furnish all of the materials, labor and equipment necessary to construct, install, survey and maintain the settlement plates in accordance with the Plans and these Specifications.
- 7.2 Materials: Plates shall be fabricated with a four foot (4') by four foot (4') by one fourth inch (3") steel plate and a three inch (3") diameter galvanized riser pipe welded to the center of the plate using a 3/16" continuous fillet. The pipe will be nine feet (9') in length and the top will be closed with a threaded galvanized cap. After fabrication, the plates shall be hot-dipped galvanized.
- 7.3 Zinc Coating: Zinc coating shall be applied in a manner and thickness quality conforming to ASTM A 123. In any case where the zinc coating becomes damaged, the damaged area shall be re-galvanized with a suitable low-melting zinc base alloy as recommended by the American Hot-Dip Galvanizers Association. One coat of a vinyl wash primer followed by red top coat shall be applied over the zinc coat. All painting shall conform to the latest edition of the LA DOTD Standard Specification Section 811 and 1008, or approved equivalent.
- 7.4 Installation: The plates shall be installed at 1,000' intervals along the centerline of the rock breakwaters as shown on the Plans. The Contractor shall exercise care when placing rock and geogrid composite in the vicinity of the settlement plates. Leveling of the plate bed shall be accomplished by removing the minimum amount of earth or rock necessary to produce a level foundation and in a manner such that the densities of the plate bed and undisturbed adjacent ground remain the same. Leveling of the plate bed by the addition of any material will not be permitted.
- 7.5 Maintenance: The Contractor shall maintain all rock settlement plates until the Work is completed. Any damaged settlement plates shall be repaired or replaced by the Contractor at no expense to the Owner. Settlement plates must be maintained in order to accurately locate the centerline elevation under the rock breakwaters.

- 7.6 Measurement and Payment: The Contractor shall submit an Application for Payment for the costs incurred to provide all labor, material, and equipment necessary to construct, install, survey and maintain the rock settlement plates as denoted in the Contract Documents. Upon installation and final acceptance by the Engineer, an invoice shall be paid at the contract unit price for Bid Item No. 6. No payment shall be made for settlement plates that are rejected or damaged due to fault or negligence by the Contractor.

## TS-8 PERMANENT WARNING SIGNS

- 8.1 Scope: The Contractor shall furnish all of the materials, labor and equipment necessary to construct and install the permanent warning signs in accordance with the Plans and these Specifications. The signs shall also conform to the regulations in the United States Coast Guard (USCG) Commandant Directives Manuals No. 16500.3 (Series), "Aids to Navigation Manual – Technical" and No. 10360-3 (Series), "Coatings and Color Manual."
- 8.2 Fabrication: The warning signs shall be fabricated from 1/8 inch thick commercial grade aluminum plate that is 3 feet high and 3 feet wide. Each sign shall be overlaid with white vinyl film. All letters and borders shall be retroreflective and match the locations, dimensions, colors and sizes shown on the Plans. The film, letters and borders shall be obtained from a USCG qualified supplier.
- The warning signs shall be supported by a seamless or straight seam commercial grade steel pipe. The dimensions of the pipe shall be 18" in diameter and 30' long. In order to prevent internal corrosion, an 18" diameter steel cap shall be welded to the top of the pipe. The pipe and cap shall be galvanized, or sandblasted and painted with marine grade epoxy primer and polyurethane topcoats according to the USGS regulations. The warning signs shall be fastened to the pipe using four (3) NC galvanized steel carriage bolts that are 1/2 inch in diameter and 20 inches long.
- 8.3 Installation: The warning signs shall be installed at 1,000' intervals and 50 feet from the centerline of the rock breakwaters as shown on the Plans prior to excavating any access or flotation channels. Each sign shall be driven to the depth shown in the Plans. Each sign shall be mounted 5 degrees from vertical and leaning down towards Lake Borgne. The face of each sign shall be parallel to the existing shoreline.
- 8.4 Measurement and Payment: The Contractor shall submit an Application for Payment for the costs incurred to provide all labor, material, and equipment necessary to construct, install, survey and maintain the permanent warning signs as denoted in the Contract Documents. Upon acceptance by the Engineer, an invoice shall be paid at the contract unit price for Bid Item No. 7. No payment shall be made for signs that are rejected or damaged due to fault or negligence by the Contractor.

## TS-9 STEEL SHEET PILE

- 9.1 Scope: The Contractor shall furnish all of the materials, labor and equipment necessary to install the steel sheet pile around the inside and outside perimeters of the back-to-back steel sheet pile structure as shown in the Plans. The length of individual sheet piles will vary between thirty feet (30') and sixty feet (60') as shown in the Plans. Sheet piles shall be braced with galvanized steel tube walers (TS-10), galvanized steel waler splices (TS-11), and tie rod assemblies (TS-12). Shop drawings and construction sequencing of this item in reference to the back-to-back steel sheet pile structure shall be provided in the Work Plan.
- 9.2 Materials: Steel sheet piles shall be hot rolled domestic steel equivalent to ASTM A 572 GR 50 PZ-27 Sections (Minimum web thickness = 0.375 in, minimum section modulus = 30.2 in<sup>3</sup>/ft, and minimum moment of inertia = 184.2 in<sup>4</sup>/ft) and fabricated in accordance with Section 807 of the Louisiana Standard Specifications For Roads and Bridges, latest Edition, or approved equivalent. The steel sheet pile alignment shall consist of approximately 112,546 square feet of sheet pile; 2,732 linear feet of thirty foot (30') long sheets, and 508 linear feet of sixty foot (60') long sheets as shown in the Plans.



- 9.3 Protective Coating: The surface of each steel sheet pile shall be cleaned, primed, and coated from the top of the sheet pile to a point 10 feet below the mud line. The surfaces to be primed and coated shall be dry grit-blasted to a near white blast finish. All work blasted in one day must be primed on that day and before the dew point has been reached. Any blasted area, not primed, which is exposed overnight, shall be at least whip-blasted again before primer application. All areas of the surface to be blasted which show any trace of oil or grease shall be degreased using V.M. and P. Naptha, or Xylol, prior to grit blasting. All surfaces to be primed shall be completely dry, free of soil, dust, oil, paint, scale, and grit at the time of application of the primer. Dry film thickness of the primer shall be 3 mils minimum. Coating shall be applied using 2 coats of coal tar epoxy-polyamide in accordance with Section 811 of the Louisiana Standard Specifications For Roads and Bridges, latest Edition or Owner approved equivalent. The Contractor shall submit certification that the minimum film thickness requirements have been met. The primer shall be allowed to cure a minimum of 24 hours before application of the coal tar-epoxy. Areas damaged during installation, such as connections or weep holes, shall be cleaned and touched up with 2 coats of coal tar epoxy-polyamide.
- 9.4 Installation: The sheet piles shall be driven in satisfactory condition to the depths and along the alignment shown in the Plans. Pile hammers shall be of approved sizes and types and maintained in proper alignment during driving operations by attachment to suitable leads or guides. A protective pile cap of approved design shall be employed during driving operations in order to prevent damage to the tops of the piles. A satisfactory alignment of the sheet piles shall be maintained by driving in increments of penetration necessary to prevent distortion, twisting or pulling of the interlocks. Piles driven out of interlock with adjacent piles or otherwise injured shall be removed and replaced by new piles at the expense of the Contractor. Use of vibratory hammers or jets is prohibited.
- Weep holes shall be drilled into the sheet piles according to the dimensions and elevation shown in the Plans. Additional holes, other than for permanent fittings, shall not be drilled into the sheet pile without approval from the Engineer.
- 9.5 Cutoffs: The tops of the steel sheet piles shall be cut off or driven to a straight line at the elevation indicated on the Plans. If the sheet piles become appreciably distorted or otherwise damaged below the cut-off level during driving, the damaged portions shall be removed and replaced at the expense of the Contractor.
- 9.6 Connections: A 1-5/16" diameter hole shall be drilled through the centerline of each sheet pile in conjunction with each tie rod (TS-12) and waler (TS-10) connection at the elevation shown in the Plans. The sheet pile shall be secured to the waler (TS-10) using a tie rod (TS-12).
- 9.7 Shipment and Storage and Handling: The steel sheet pile shall be adequately protected from damage during shipment, storage and handling. The sheet pile shall be sorted and stacked at the Project Site to prevent distortion and to facilitate proper sequence of setting and driving. During shipment and storage, the sheet pile shall be supported by wood blocks which are spaced not more than 10 feet apart or more than 2 feet from the ends of the piles. During handling, the sheet pile shall be supported by slings, strong backs, or other methods. Each pile shall be labeled or tagged with the manufacturer's name, product identification, shipping lot, dimensions, weight, and date of manufacture.
- 9.8 Measurement and Payment: The Contractor shall submit an Application for Payment for the costs incurred to provide all labor, material, and equipment necessary to construct and install the steel sheet pile as denoted in the Contract Documents. Upon acceptance by the Engineer, an invoice shall be paid at the contract unit price for Bid Item No. 8. No payment shall be made for steel sheet pile that are rejected or damaged due to fault or negligence by the Contractor.

## TS-10 GALVANIZED STEEL TUBE WALERS

- 10.1 Scope: The Contractor shall furnish all of the materials, labor and equipment necessary to fabricate and assemble the galvanized steel tube walers onto the steel sheet pile (TS-9). Shop drawings and construction sequencing of this item in reference to the back-to-back steel sheet pile structure shall be provided in the Work Plan.
- 10.2 Materials: The walers shall consist of ASTM A500 Grade B 6"x6"x1/4" galvanized steel tubing.
- 10.3 Installation: The walers shall extend around the full perimeter of the sheet pile structure according to the elevation and alignment shown on the Plans.
- 10.4 Connections: A 2.875" diameter hole shall be drilled through the centerline of each waler in conjunction with each tie rod (TS-12) to sheet pile (TS-9) connection at the elevation shown in the Plans. A 2 1/2" Diameter Schedule 80 Steel Pipe shall be welded to both sides of the waler inside the 2.875" diameter hole as shown on the Plans. The waler shall be secured to the sheet pile (TS-9) using the tie rod assemblies (TS-12). Walers shall be connected together by waler splices (TS-11) along the entire alignment of the structure. Four (4) 13/16" diameter holes shall be drilled through both ends of each waler as shown on the Plans. Successive walers shall be fastened together with a waler splice (TS-11) and eight (8) 3/4 inch diameter A307 galvanized bolts as shown in the Plans.
- 10.5 Shipment and Storage: The walers shall be adequately protected from damage during shipment and storage. Each waler shall be labeled or tagged with the manufacturer's name, product identification, shipping lot, dimensions, weight, and date of manufacture.
- 10.6 Measurement and Payment: The Contractor shall submit an Application for Payment for the costs incurred to provide all labor, material, and equipment necessary to construct and install the galvanized steel tube walers as denoted in the Contract Documents. Upon acceptance by the Engineer, an invoice shall be paid at the contract unit price for Bid Item No. 9. No payment shall be made for galvanized steel tube walers that are rejected or damaged due to fault or negligence by the Contractor.

## TS-11 GALVANIZED STEEL WALER SPLICES

- 11.1 Scope: The Contractor shall furnish all of the materials, labor and equipment necessary to fabricate and assemble the galvanized steel waler splices onto the walers (TS-10). Shop drawings and construction sequencing of this item in reference to the back-to-back steel sheet pile structure shall be provided in the Work Plan.
- 11.2 Materials: Each waler splice shall consist of a 3/8"x6"x13" A36 galvanized steel plate which has an eight (8) bolt hole (13/16" diameter) pattern as shown on the Plans.
- 11.3 Installation: Waler splices shall be used to fasten together all successive walers (TS-10) along the alignment and at all bends of the structure.
- 11.4 Connections: Waler splices shall be fastened to successive walers (TS-10) using eight (8) 3/4" diameter A307 galvanized bolts.
- 11.5 Shipment and Storage: The waler splices shall be adequately protected from damage during shipment and storage. Each waler splice shall be labeled or tagged with the manufacturer's name, product identification, shipping lot, dimensions, weight, and date of manufacture.
- 11.6 Measurement and Payment: The Contractor shall submit an Application for Payment for the costs incurred to provide all labor, material, and equipment necessary to construct and install the galvanized steel waler splices as denoted in the Contract Documents. Upon acceptance by the Engineer, an invoice shall be paid at the contract unit price for Bid Item No. 10. No payment shall be made for galvanized steel waler splices that are rejected or damaged due to fault or negligence by the Contractor.

## TS-12 TIE ROD ASSEMBLIES

- 12.1 Scope: The Contractor shall furnish all of the materials, labor and equipment necessary to install tie rod assemblies onto the back-to-back steel sheet pile structure. Each assembly shall consist of a galvanized steel tie rod that is protected by a PVC pipe sleeve. Shop drawings and construction sequencing of this item in reference to the back-to-back steel sheet pile structure shall be provided in the Work Plan.
- 12.2 Materials: The tie rods shall consist of A36 steel and have a diameter equal to 1-1/4 inches and length equal to 16 feet, except at each tapered end of the structure where the length equals 10 feet. Tie rods shall be fabricated, trimmed and galvanized by the manufacturer. The PVC pipe shall have a diameter equal to 3 inches and length equal to 14 feet, except at each tapered end of the structure where the length equals 7.0 feet. The outside ends of the tie rods shall be fastened to the walers using one 2-1/2 inch diameter galvanized steel washer and one 1-1/4 inch diameter galvanized steel hex nut, except at each tapered end of the structure where a 45 degree angle steel spacer shall be inserted between the washer and waler on the tie rod in order to provide a flat mounting surface.
- 12.3 Installation: The tie rod assemblies shall brace the walers (TS-10) against the sheet piles (TS-9) according to the spacing interval and elevation shown on the Plans. The tie rods shall be inserted through the 1-5/16 inch diameter holes in the sheet piles (TS-9) and walers (TS-10). The tie rods shall be aligned perpendicular (90 degree angle) to the centerline of the alignment. Each tie rod shall also be sleeved with one 3 inch diameter PVC pipe after the tie rod is inserted into place and before the connections are made. The Contractor shall replace any tie rods which become damaged during construction of the rock protection layer.
- 12.4 Connections: The nuts on either end of each tie rod assembly shall be tightened until a maximum deflection of 1 inch exists at the middle of each tie rod. All connections shall be inspected and documented on the Daily Progress Report by the Contractor.
- 12.5 Shipment and Storage: The tie rods and PVC sleeve pipe shall be adequately protected from damage during shipment and storage. Each item shall be labeled with the manufacturer's name, product identification, shipping lot, dimensions, weight, and date of manufacture.
- 12.6 Measurement and Payment: The Contractor shall submit an Application for Payment for the costs incurred to provide all labor, material, and equipment necessary to construct and install the tie rod assemblies as denoted in the Contract Documents. Upon acceptance by the Engineer, an invoice shall be paid at the contract unit price for Bid Item No. 11. No payment shall be made for tie rod assemblies that are rejected or damaged due to fault or negligence by the Contractor.

## TS-13 SAND FILL

- 13.1 Scope: The Contractor shall furnish all of the materials, labor and equipment necessary to place the sand fill within the back-to-back steel sheet pile structure in conformity to the lines, grades and thicknesses shown on the Plans or as directed by the Engineer. Shop drawings and construction sequencing of this item in reference to the back-to-back steel sheet pile structure shall be provided in the Work Plan.

- 13.2 **Materials:** The sand fill shall be reasonably free from earth and other foreign materials and contaminants. Sand shall conform to Section 1003.07 of the Louisiana Standard Specifications for Roads and Bridges and consist of the following properties:

Sieve	% Passing
1/2"	100
No. 10	75-100
No. 200	0-10

The gradation of the sand fill shall be tested for conformity with this specification using the LADOTD TR-407 grain size distribution test. The test shall be performed by a professional engineer licensed by the State of Louisiana. The test results shall be presented numerically and graphically, and submitted to the Engineer for written approval prior to placement. Laboratory testing shall be furnished at the expense of the Contractor.

- 13.3 **Placement:** The steel sheet pile (TS-9), galvanized steel tube walers (TS-10), and galvanized steel tie rod assemblies (TS-12) must be fully installed prior to placement of the sand fill layer. The sand fill layer shall be placed into the center of the structure using a clam shell bucket, or approved equal, and worked towards the outside to the uniform elevation stated in the Plans.
- 13.4 **Tolerances:** The sand fill layer for the sheet pile structure shall be placed according to the cross sections (Elevations, dimensions, etc.) shown on the Plans with a maximum tolerance of plus or minus half a foot ( $\pm 0.5'$ ). Any sand placed outside of the specified tolerance will not be paid for by the Owner and must be added or removed by the Contractor.
- 13.5 **Acceptance:** The Contractor shall inspect and perform process surveys of the sand fill layer after it is completed (Day 1) and two weeks later (Day 14), and perform an As-Built survey four weeks later (Day 28) in order to determine compliance with the cross section and available tolerances provided in the Plans and Specifications. The survey shall gather a minimum of 8 survey points under the supervision of the Engineer or Inspector. If the elevation of the sand fill layer is below the tolerance for the target elevation after 30 days of placement, the Engineer will require the Contractor to place a secondary lift of sand to the elevation stated in the Plans and resurvey. The Contractor must obtain written approval from the Engineer for acceptance of the sand fill layer based on the laboratory test results and final elevation. The geogrid composite and rock protection layer may not be placed until the sand fill is accepted by the Engineer. The Contractor may request partial monthly payments for the completed sand fill after the inspection provided that it is within the acceptable tolerances. Otherwise, the Engineer shall require the Contractor to add or remove sand as necessary to achieve acceptance and receive partial payment.
- 13.6 **Measurement and Payment:** The Contractor shall submit an Application for Payment for the costs incurred to provide all labor, material, and equipment necessary to place the sand fill as denoted in the Contract Documents. The unit of measurement for quantities of sand shall be the nearest whole cubic yard. The quantity of sand shall be measured by the Contractor and verified using a method that is approved by the Engineer. Upon acceptance by the Engineer, an invoice shall be paid at the contract unit price for Bid Item No. 12. No payment shall be made for sand that is misplaced or mishandled due to fault or negligence by the Contractor.

## TS-14 DELIVERABLES

- 14.1 Prior to Construction:
- 14.1.1 The Contractor shall submit the following documents to the Engineer prior to the Pre-Construction Conference specified in GP-14:
- 14.1.1.1 Work Plan as specified in GP-8;
- 14.1.1.2 Progress Schedule as specified in GP-9;

- 14.1.1.3 Copy of typical Daily Progress Report as specified in GP-10;
- 14.1.1.4 Hurricane and Severe Storm Plan as specified in GP-11;
- 14.1.1.5 Health and Safety Plan as specified in GP-12.
- 14.1.2 The Contractor shall provide the following information to the Engineer at the Pre-Construction Conference specified in GP-14:
  - 14.1.2.1 Updates to all plans and schedules based on comments from the Engineer;
  - 14.1.2.2 Potential access corridors which may be approved on an as needed basis.
- 14.2 During Construction:
  - 14.2.1 The Contractor shall deliver copies of the following documents upon request by the Engineer, or as specified in these provisions:
    - 14.2.1.1 The results of all surveys and calculations specified in TS-3;
    - 14.2.1.2 Progress Schedule as specified in GP-9;
    - 14.2.1.3 Daily Progress Report as specified in GP-10;
    - 14.2.1.4 Copies of all inspection reports;
    - 14.2.1.5 All Change Orders, Field Orders, Claims, Clarifications and Amendments;
    - 14.2.1.6 Results of any materials testing.
- 14.3 Post Construction:

The Contractor shall contact the Engineer by phone, a minimum of five (5) working days prior to the anticipated completion of the Work in order to schedule the final inspection and gain Acceptance by the Engineer. The following documents shall also be submitted to the Engineer:

  - 14.3.1 Copies of all delivery slips, which shall include the source of construction materials, date of delivery, exact quantity, and size of materials delivered with each shipment to the Project Site.
  - 14.3.2 The Contractor shall furnish the Engineer with the As-Built Drawings in accordance with TS-3.3.

**APPENDIX A: INTERPRETATION OR CLARIFICATION BY ENGINEER FORM**

Lake Borgne Shoreline Protection Project PO-30  
Interpretation or Clarification by Engineer  
Number ( \_\_\_\_ )

DATE:

SUBJECT:

SUMMARY OF MATTER BY CONTRACTOR

INTERPRETATION OR CLARIFICATION OF MATTER BY ENGINEER

**APPENDIX B: LANDRIGHTS MEMORANDUM**



November 29, 2005

Memorandum

To: Chris Williams, CED Project Manager  
From: Helen Hoffpauir, CRD Land Manager  
RE: Completion of Landrights for Lake Borgne Shoreline Protection at Shell Beach & Bayou Dupont Project PO-30/31

The CRD Land Section has completed additional landrights necessary to proceed to construction contracting on the above referenced project. The following information has already been transmitted to you, but if you are missing anything, please contact me for additional copies:

- Servitude Agreement(s)*
- Pipeline Agreement(s)*
- Oil/Gas Operator Agreement(s)*
- Memorandum(s) of Agreement*
- CWPPRA Section 303(e) approval*
- Right(s) of Entry for Construction*
- Mineral Operations Agreement(s)*
  
- Grant of Particular Use*
- State Land Office Letter of No Objection*
- Assignment of Rights to Federal Sponsor*
- Landrights Certification Letter*
- Other (Authorization for Entry for Construction, Letters of No Objection, Utility Access Agreements)*

Please be aware of the following important information, some of which will be used in the contracting specifications and requirements. There are no extraordinary requirements by landowners, but the notification requirement and the construction parameters to which the landowners' agreed is outlined below.

**Easements, Servitudes and Rights-of-Way:**

**1. Tract 1, The Borgnemouth Realty Company, Limited**

Oliver S. Delery, President  
P.O. Box 945  
Meraux, LA 70075  
(504) 483-6001

- II. STATE agrees to give reasonable notice to GRANTOR prior to initiation of access to the said Lands which is required to implement, construct, operate, modify, monitor, and maintain the Project.

*For your information, this is the primary construction component agreed to by the landowner:*

**Exhibit B**

- a. The right to construct (including the necessary excavation and/or filling), maintain and monitor a continuous rock breakwater shoreline protection, and all the appurtenances thereto, along south rim of Lake Borgne, placed on the shoreline of the said Lands as shown on Exhibit A; said shoreline protection feature **may** include, at selected locations in the Bayou Dupre area, bulkheads constructed of sheet pile, woodpile, or a combination thereof; see detail on Exhibit C;
- 2. Tract 2, Violet Canal, Inc.**  
Ms. Rita Gue, President  
P.O. Box 1738  
Meraux, LA 70075-1738  
(504) 271-8421

- II. STATE agrees to give reasonable notice to GRANTOR prior to initiation of access to the said Lands which is required to implement, construct, operate, modify, monitor, and maintain the Project.

*For your information, this is the primary construction component agreed to by the landowner:*

**Exhibit B**

- a. The right to construct (including the necessary excavation and/or filling), maintain and monitor a continuous rock breakwater shoreline protection, and all the appurtenances thereto, along south rim of Lake Borgne, placed on the shoreline of the said Lands as shown on Exhibit A; said shoreline protection feature **may** include, at selected locations in the Bayou Dupre area, bulkheads constructed of sheet pile, woodpile, or a combination thereof; see detail on Exhibit C;
- 3. LAC Real Estate Holdings, LLC, and CARMA Holdings, LLC**  
C/O Carolyn LeBlanc  
LAC Real Estate Holdings, LLC

P.O. Box 455  
Lafitte, LA 70067  
(504) 340-7003  
C/O Gustave Carmadelle  
CARMA Holdings, LLC  
7855 Barataria Boulevard  
Crown Point, LA 70072  
(504) 689-2373

- a. STATE agrees to give reasonable notice to GRANTOR prior to initiation of access to the said Lands which is required to implement, construct, operate, modify, monitor, and maintain the Project.

For your information, this is the primary construction component agreed to by the landowner:

**Exhibit B**

- a. The right to construct (including the necessary excavation and/or filling), maintain and monitor a continuous rock breakwater shoreline protection, and all the appurtenances thereto, along south rim of Lake Borgne, placed on the shoreline of the said Lands as shown on Exhibit A; said shoreline protection feature **may** include, at selected locations in the Bayou Dupre area, bulkheads constructed of sheet pile, woodpile, or a combination thereof; see detail on Exhibit C;
4. **Lake Borgne Basin Levee District**  
**George E. Lopez, President**  
C/O Robert A. Turner, Jr. - contact  
P.O. Box 216  
Violet, LA 70092  
(504) 682-5941

- II. STATE agrees to give reasonable notice to GRANTOR prior to initiation of access to the said Lands which is required to implement, construct, operate, modify, monitor, and maintain the Project.

For your information, this is the primary construction component agreed to by the landowner:

**Exhibit B**

- a. The right to construct (including the necessary excavation and/or filling), maintain and monitor a continuous rock breakwater shoreline protection, and all the appurtenances thereto, along south rim of Lake Borgne, placed on the shoreline of the said Lands as shown on Exhibit A; said shoreline protection feature **may** include, at selected locations in the Bayou Dupre area, bulkheads constructed of sheet pile, woodpile, or a combination thereof; see detail on Exhibit C;
5. **Jim & Wayne, Inc.**  
Wayne Vidrine, President  
4742 Argonne Street  
Metairie LA 70001  
(504) 455-8003

- II. STATE agrees to give reasonable notice to GRANTOR prior to initiation of access to the said Lands which is required to implement, construct, operate, modify, monitor, and maintain the Project.

*For your information, this is the primary construction component agreed to by the landowner:*

**Exhibit B**

- a. The right to construct (including the necessary excavation and/or filling), maintain and monitor a continuous rock breakwater shoreline protection, and all the appurtenances thereto, along south rim of Lake Borgne, placed on the shoreline of the said Lands as shown on Exhibit A; said shoreline protection feature **may** include, at selected locations in the Bayou Dupre area, bulkheads constructed of sheet pile, woodpile, or a combination thereof; see detail on Exhibit C;

**6. Tract 6 The Livaudais Company, LLC**

Gatien J. Livaudais, Jr. - contact  
Oliver S. Delery  
R. Bruce Wallis  
Robert J. Klees, its Managers  
P.O. Box 945  
Meraux, LA 70075  
(504) 271-2837

- II. STATE agrees to give reasonable notice to GRANTOR prior to initiation of access to the said Lands which is required to implement, construct, operate, modify, monitor, and maintain the Project.

*For your information, this is the primary construction component agreed to by the landowner:*

**Exhibit B**

- a. The right to construct (including the necessary excavation and/or filling), maintain and monitor a continuous rock breakwater shoreline protection, and all the appurtenances thereto, along south rim of Lake Borgne, placed on the shoreline of the said Lands as shown on Exhibit A; said shoreline protection feature **may** include, at selected locations in the Bayou Dupre area, bulkheads constructed of sheet pile, woodpile, or a combination thereof; see detail on Exhibit C;

**7. Tract 7 Shell Beach Partners, LLC**

C/O Hugh Uhalt - contact  
634 Carondelet Street  
New Orleans, LA 70130  
(504) 581-5444  
James M. Trotter, III  
82 Ute Place  
Aspen, CO 81611-2162

- II. STATE agrees to give reasonable notice to GRANTOR prior to initiation of access to the said Lands which is required to implement, construct, operate, modify, monitor, and maintain the Project.

For your information, this is the primary construction component agreed to by the landowner:

- a. The right to construct (including the necessary excavation and/or filling), maintain and monitor a continuous rock breakwater shoreline protection, and all the appurtenances thereto, along south rim of Lake Borgne, placed on the shoreline of the said Lands as shown on Exhibit A; said shoreline protection feature **may** include, at selected locations in the Bayou Dupre area, bulkheads constructed of sheet pile, woodpile, or a combination thereof; see detail on Exhibit C;

8. **Tract 8 Parish of St. Bernard**

Henry J. Rodriguez, Jr., Parish President  
8201 West Judge Perez Drive  
Chalmette, LA 70043  
(504) 278-4227

- II. STATE agrees to give reasonable notice to GRANTOR prior to initiation of access to the said Lands which is required to implement, construct, operate, modify, monitor, and maintain the Project.

For your information, this is the primary construction component agreed to by the landowner:

- a. The right to construct (including the necessary excavation and/or filling), maintain and monitor a continuous rock breakwater shoreline protection, and all the appurtenances thereto, along south rim of Lake Borgne, placed on the shoreline of the said Lands as shown on Exhibit A; said shoreline protection feature **may** include, at selected locations in the Bayou Dupre area, bulkheads constructed of sheet pile, woodpile, or a combination thereof; see detail on Exhibit C;

9. **Tract 9 Doullut Realty Company, Inc.**

C/O MILTON GAGNON  
3901 Edenborn Avenue  
Metairie, LA 70002  
(504) 454-1554

- II. STATE agrees to give reasonable notice to GRANTOR prior to initiation of access to the said Lands which is required to implement, construct, operate, modify, monitor, and maintain the Project.

For your information, this is the primary construction component agreed to by the landowner:

- a. The right to construct (including the necessary excavation and/or filling), maintain and monitor a continuous rock breakwater shoreline protection, and all the appurtenances thereto, along south rim of Lake Borgne, placed on the shoreline of the said Lands as shown on Exhibit A; said shoreline protection feature **may** include, at selected locations in the Bayou Dupre area, bulkheads constructed of sheet pile, woodpile, or a combination thereof; see detail on Exhibit C;

10. **Tract 10 Louis D. Haeuser**

Louis D. Haeuser  
7266 Ring Street  
New Orleans, LA 70124  
(504) 283-2381

- II. STATE agrees to give reasonable notice to GRANTOR prior to initiation of access to the said Lands

which is required to implement, construct, operate, modify, monitor, and maintain the Project.

For your information, this is the primary construction component agreed to by the landowner:

a. The right to construct (including the necessary excavation and/or filling), maintain and monitor a continuous rock breakwater shoreline protection, and all the appurtenances thereto, along south rim of Lake Borgne, placed on the shoreline of the said Lands as shown on Exhibit A; said shoreline protection feature **may** include, at selected locations in the Bayou Dupre area, bulkheads constructed of sheet pile, woodpile, or a combination thereof; see detail on Exhibit C;

**11. Tract 10A Roeling G. Wellmeyer**

Roeling G. Wellmeyer  
3608 Lake Ontario Drive  
Harvey, LA 70058  
(504) 366-1880

II. STATE agrees to give reasonable notice to GRANTOR prior to initiation of access to the said Lands which is required to implement, construct, operate, modify, monitor, and maintain the Project.

For your information, this is the primary construction component agreed to by the landowner:

a. The right to construct (including the necessary excavation and/or filling), maintain and monitor a continuous rock breakwater shoreline protection, and all the appurtenances thereto, along south rim of Lake Borgne, placed on the shoreline of the said Lands as shown on Exhibit A; said shoreline protection feature **may** include, at selected locations in the Bayou Dupre area, bulkheads constructed of sheet pile, woodpile, or a combination thereof; see detail on Exhibit C;

**12. Tract 10B Rita Morris Hoehn, etal**

Janet Hoehn Degeorge  
7 Carroll Drive  
Chalmette, LA 70043  
(504) 277-7278  
- OR -  
Rita M. Hoehn  
200 Deer Lake Circle  
Ormond Beach, FL 32074  
(386) 677-6308

II. STATE agrees to give reasonable notice to GRANTOR prior to initiation of access to the said Lands which is required to implement, construct, operate, modify, monitor, and maintain the Project.

For your information, this is the primary construction component agreed to by the landowner:

a. The right to construct (including the necessary excavation and/or filling), maintain and monitor a continuous rock breakwater shoreline protection, and all the appurtenances thereto, along south rim of Lake Borgne, placed on the shoreline of the said Lands as shown on Exhibit A; said shoreline protection feature **may** include, at selected locations in the Bayou Dupre area, bulkheads constructed of sheet pile, woodpile, or a combination thereof; see detail on Exhibit C;

13. **Tract 10 Doerr Furniture, Inc.**

Julian Mutter  
914 Elysian Fields Avenue  
New Orleans, LA 70117  
(504) 947-0606

II. STATE agrees to give reasonable notice to GRANTOR prior to initiation of access to the said Lands which is required to implement, construct, operate, modify, monitor, and maintain the Project.

*For your information, this is the primary construction component agreed to by the landowner:*

- a. The right to construct (including the necessary excavation and/or filling), maintain and monitor a continuous rock breakwater shoreline protection, and all the appurtenances thereto, along south rim of Lake Borgne, placed on the shoreline of the said Lands as shown on Exhibit A; said shoreline protection feature **may** include, at selected locations in the Bayou Dupre area, bulkheads constructed of sheet pile, woodpile, or a combination thereof; see detail on Exhibit C;

14. **Estate of Arlene V. Meraux**

Rita O. Gue and Floyd E. Gue,  
Testamentary Independent Co-Executors of the Arlene V. Meraux Estate  
P.O. Box 1738  
Meraux, LA 70075  
(504) 271-8421

II. STATE agrees to give reasonable notice to GRANTOR prior to initiation of access to the said Lands which is required to implement, construct, operate, modify, monitor, and maintain the Project.

*For your information, this is the primary construction component agreed to by the landowner:*

- b. The right to construct (including the necessary excavation and/or filling), maintain and monitor a continuous rock breakwater shoreline protection, and all the appurtenances thereto, along south rim of Lake Borgne, placed on the shoreline of the said Lands as shown on Exhibit A; said shoreline protection feature **may** include, at selected locations in the Bayou Dupre area, bulkheads constructed of sheet pile, woodpile, or a combination thereof; see detail on Exhibit C;

**Pipelines:**

**Tennessee Gas Pipeline (TGP) Letter of No Objection:**

1. Said letter of no objection allows STATE, its successors, assigns or transferees to cross TGP's pipeline with floating equipment within the Project area. STATE, shall coordinate with TGP representatives prior to movement of equipment to ensure pipeline integrity is maintained throughout the duration of STATE's project.
2. Location of ingress/egress routes shall be coordinated with TGP prior to the commencement of construction activities.
3. STATE shall provide reasonable notice of ingress and egress to TGP, specifically to Mr. Larry Slowik, Houma Area Manager, 985-879-3516, ext. 2022.
4. STATE shall indemnify and hold TGP harmless from any loss, liability, claims or damages arising

out of the Project activities where such loss, liability, claim or damage is caused by STATE, its employees, Contractors or subContractors.

TGT Pipeline Contact Information:

Mr. Kurt J. Cheramie

Tennessee Gas Pipeline

115 Regal Row

Houma, Louisiana 70360

985-868-6785 ext 2217

Larry Slowik, Houma Area Manager, 985-879-3516, ext. 2022



**APPENDIX C: GOVERNMENT PERMITS**



## DEPARTMENT OF ENVIRONMENTAL QUALITY

KATHLEEN BABINEAUX BLANCO  
GOVERNOR

MIKE D. McDANIEL, Ph.D.  
SECRETARY

March 28, 2006

Louisiana Department of Natural Resources- Coastal Restoration Division  
617 North Third Street, Suite 1078  
Baton Rouge, LA 70802

Attention: Chris Williams, Agent for St. Bernard Parish

RE: Water Quality Certification (JP 060118-01/A1 105663/CER 20060001)  
Corps of Engineers Permit (MVN-2005-4407-EBB)  
St. Bernard Parish

Dear Mr. Williams:

The Department has reviewed your request to dredge waterbottoms and place spoil and fill material for erosion control/bank stabilization project in Lake Borgne near Shell Beach, Louisiana in St. Bernard Parish.

The requirements for Water Quality Certification have been met in accordance with LAC 33:IX.1507.A-E. Based on the information provided in your application, we have determined that the placement of the fill material will not violate the water quality standards of Louisiana provided for under LAC 33:IX.Chapter 11. Therefore, the Department has issued a Water Quality Certification.

Sincerely,

Thomas R. Griggs  
Engineer Manager

TRG/jjp

c: Corps of Engineers- New Orleans District

# DEPARTMENT OF THE ARMY PERMIT

Permittee: St. Bernard Parish

Permit No. MVN 2005-4407 EBB

Issuing Office: New Orleans District

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: Dredge an access channel and install and maintain riprap and sheet pile and temporarily place spoil in open water, in accordance with drawings enclosed in thirty five sheets dated November 2005.

Project Location: The Shell Beach site is located at Latitude 29°22'10" North, Longitude 90°19'48" West, and the Bayou Dupree site is located at Latitude 29°25'34" North, Longitude 90°09'36" West, in St. Bernard Parish.

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on **DECEMBER 31, 2011**. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least 1 month before the above date is reached.
2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.
3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.
5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.
6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

**Special Conditions: Page 4.**

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

- Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).
- Section 404 of the Clean Water Act (33 U.S.C. 1344).
- Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

- a. This permit does not obviate the need to obtain other Federal, State, or local authorizations required by law.
- b. This permit does not grant any property rights or exclusive privileges.
- c. This permit does not authorize any injury to the property or rights of others.
- d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

- a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.
- b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.
- c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.
- d. Design or construction deficiencies associated with the permitted work.

- e. Damage claims associated with any future modification, suspension, or revocation of this permit.
4. Reliance on Applicant's Data: The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.
5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:
- a. You fail to comply with the terms and conditions of this permit.
  - b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).
  - c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

X *L. Cle Witham* (PERMITTEE)      X *11/20/2006* (DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

*Ronald J. Ventola* (DATE) *13 Dec 2006*  
 Ronald J. Ventola, Chief Regulatory Branch

for Richard P. Wagenaar, District Commander

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

\_\_\_\_\_  
 (TRANSFEEE) (DATE)

**SPECIAL CONDITIONS: MVN 2005-4407 EBB**

7. The permittee understands and agrees that, if future operations by the United States require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

8. You must install and maintain at your expense, any safety lights, signs, and signals prescribed by the U.S. Coast Guard, through regulations or otherwise, on any equipment utilized in your authorized activity

9. Your use of the permitted activity must not interfere with the public's right to free navigation on all navigable waters of the United States.

10. If the proposed project, or future maintenance work, involves the use of floating construction equipment (barge mounted cranes, barge mounted pile driving equipment, floating dredge equipment, dredge discharge pipelines, etc.) in the waterway, you are advised to notify the Eighth Coast Guard District so that a Notice to Mariners, if required, may be prepared. Notification, with a copy of your permit approval and drawings, should be mailed to the Commander (oan), Eighth Coast Guard District, ATTN: Marine Information Branch, 501 Magazine Street, New Orleans, Louisiana 70130-3396, about 1 month before you plan to start work. Telephone inquiries can be directed to (504) 589-6277.

December 1, 2005

## FINDING OF NO SIGNIFICANT IMPACT

### To All Interested Agencies and Public Groups:

In accordance with the environmental review guidelines of the Council on Environmental Quality at 40 Code of Federal Regulations Part 1500, the U. S. Environmental Protection Agency (EPA) has performed an Environmental Assessment (EA) of the following proposed action under the authority of the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) of November 1990, House Document 646, 101<sup>st</sup> Congress (Public Law 101-646).

**Project Name:** Lake Borgne Shoreline Protection Project (PO-30)

**Sponsors:** U. S. Environmental Protection Agency, Region 6  
Louisiana Department of Natural Resources

<u>Total estimated funding</u>	<u>\$21,294,512</u>
Phase 1 (Engineering and Design) funding	\$ 1,764,954
Phase 2 (Construction) funding	\$19,529,558

**Location:** The proposed project is divided into two sections, Bayou Dupre' and Shell Beach, of the southern shoreline of Lake Borgne, in Pontchartrain Basin, St. Bernard Parish, Louisiana

**Introduction.** Maintenance dredging within the Mississippi River Gulf Outlet (MRGO) has created an unnatural water depth at the mouth of Bayou Dupre'. The objective of project PO-30 is to maintain the integrity of the narrow strip of marsh that separates Lake Borgne from the MRGO, halt direct marsh loss, restore saline marsh habitat, re-establish a sustainable lake rim, and enhance fish and wildlife habitat. Phase 1 funding for the Shell Beach portion of the project was approved on January 10, 2001, and was included in the CWPPRA 10<sup>th</sup> Priority Project List. Phase 1 funding for the Bayou Dupre' portion of the project was approved on January 16, 2002, and was included on the CWPPRA 11<sup>th</sup> Priority Project List. The Louisiana Coastal Wetlands Conservation and Restoration Task Force approved combining these projects on April 2002.

The proposed PO-30 project is part of and consistent with the Task Force, and the Wetlands Conservation and Restoration Authority ecosystem strategy to maintain shoreline integrity, dedicated dredging and beneficial use of dredged material. CWPPRA provides Federal funds for planning and implementing projects that create, protect, restore and enhance wetlands in coastal Louisiana. Under CWPPRA, the project cost is shared between the sponsoring Federal agency and the State of Louisiana, with the Federal government providing 85 percent of the project cost and the Louisiana Department of Natural Resources (LDNR) providing the remaining 15 percent.

**Proposed Action.** The proposed *Combination Rock Breakwaters and Steel Sheet* project would construct a continuous rock breakwater along the designated shoreline section of Lake Borgne at Bayou Dupre' and Shell Beach. A steel sheet pile structure will tie the proposed breakwater into the existing offshore U.S. Army Corps of Engineers rock breakwater along the MRGO. At Shell Beach, the proposed rock breakwater will tie into the existing rock breakwater which surrounds the perimeter of Fort Beauregard. The only opening in the breakwater will occur along the mouth of Bayou Yscloskey and across the Tennessee Gas Pipeline right-of-way. End-on-construction will be constructed along the former naval base at Shell Beach to avoid the debris in the area, and will not require flotation access because all activities will be within the footprint of the breakwater. A temporary flotation channel will be excavated along the shoreline in order to facilitate construction and maintenance of the rock breakwater. Approximately 281,461 cubic yards of spoil will be deposited on the lake side of the flotation channel and graded down into the flotation channel after construction or maintenance of the rock breakwater is complete. The design life for the proposed project is 20 years.

**Finding.** On the basis of the EA performed by the EPA of the proposed project, and other findings and available information, the Regional Administrator has determined that the proposed project is not a major Federal action significantly adversely affecting the quality of the human environment, and that the preparation of an Environmental Impact Statement (EIS) is not warranted. This preliminary Finding of No Significant Impact will become final 30 days after the issuance of the public notice if no new information is received to alter this finding. No administrative action will be taken on this decision during the 30-day comment period. Comments regarding this preliminary decision not to prepare an EIS, requests for copies of the EA, or review of the Administrative Record containing the information supporting this decision, may be submitted to the U.S. Environmental Protection Agency; Office of Planning and Coordination (6EN-XP); 1445 Ross Avenue, Suite 1200; Dallas, Texas 75202-2733, or by telephone at (214) 665-8150.

Responsible Official,

John Blevins  
Director  
Compliance Assurance  
and Enforcement Division



**ENVIRONMENTAL ASSESSMENT**  
**for the**  
**LAKE BORGNE SHORELINE PROTECTION PROJECT (PO-30)**  
**ST. BERNARD PARISH, LOUISIANA**

**1.0 SUMMARY**

**1.1 Summary of Environmental Assessment**

- Project Name:** Lake Borgne Shoreline Protection Project (PO-30)
- Location:** The proposed project has two sections, Bayou Dupre' and Shell Beach, located on the southern shoreline of Lake Borgne in the Pontchartrain Basin, St. Bernard Parish, Louisiana. The Shell Beach section extends approximately 3.2 miles between Fort Bayou and Doulluts Canal, and the Bayou Dupre' section extends approximately 1.3 miles to the west and 0.8 miles to the southeast of Bayou Dupre' (Figure 1).
- Sponsors:** U.S. Environmental Protection Agency (EPA), Region 6  
Louisiana Department of Natural Resources (LDNR).
- |  |              |
|--|--------------|
| <u>Total estimated funding</u>           | \$21,294,512 |
| Phase 1 (Engineering and Design) funding | \$ 1,764,954 |
| Phase 2 (Construction) funding           | \$19,529,558 |
- Land rights:** There are 26 landowners located within 14 tracts
- Purpose and Need:** To maintain the integrity of the narrow strip of marsh that separates Lake Borgne from the Mississippi River Gulf Outlet (MRGO), halt direct marsh loss, restore saline marsh habitat, re-establish a sustainable lake rim, and enhance fish and wildlife habitat. The project as proposed is consistent with the 1998 Coast 2050 Plan, Region 1 ecosystem strategy to maintain shoreline integrity, dedicated dredging and beneficial use of dredged material. The proposed project is not expected to cause adverse environmental impacts requiring compensatory mitigation.
- Dredged Material:** Approximately 281,461 cubic yards (cy).
- Wetlands:** Shell Beach - saline marsh  
Bayou Dupre' - brackish and saline marsh
- Threatened and Endangered Species:** The threatened Gulf sturgeon and the endangered West Indian manatee may occur in the proposed project vicinity. The proposed project is not expected to adversely impact these species.
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**Cultural Resources:** There are no known cultural or historic sites eligible to be listed on the National Register of Historic Places (NRHP) in the Bayou Dupre' project area. Fort Proctor, also known as Fort Beauregard - 16SB83, is listed on the NRHP in the Shell Beach project area. The project is not expected to adversely impact this site.

**Permits and Compliance:** Construction<sup>1</sup> of the project is authorized to begin after all applicable environmental laws and regulations are met, project plans finalized, necessary land rights acquired, permits issued<sup>2</sup> and approval of the Louisiana Coastal Wetlands Conservation and Restoration Task Force established by the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA), Title III of Public Law 101-646. The Task Force consists of the Natural Resources Conservation Service (NRCS); the U.S. Army Corps of Engineers (ACE), National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), the U.S. Fish and Wildlife Service (FWS), and the EPA. The Governor represents the State of Louisiana, with the LDNR providing the primary source of the non-Federal share of funding.

**1.2 Background.** Maintenance dredging within the MRGO has created an unnatural water depth at the mouth of Bayou Dupre'. In 1990, the South Lake Borgne mapping unit consisted of 16,600 acres (ac) of marsh. Between 1932 and 1990, approximately 7,300 ac of wetlands were lost in the mapping unit. Data from the Coast 2050 Plan indicates a wetland loss rate of approximately 0.33 percent per year from 1983-1990, and approximately 0.51 percent per year from 1974-1990, for the mapping unit. This loss rate includes natural and shoreline and canal erosion. Subsidence in the area is estimated at 1.1-2.0 feet (ft) per century. It is projected that about 3,310 ac of wetlands will be lost by 2050 for this mapping unit.

According to Louisiana Geological Survey data cited in the CWPPRA Restoration Plan, Lake Borgne shoreline retreat rates at Shell Beach are estimated at 15 ft per year (ft/yr). If the shoreline continues to erode at this rate, an additional 300 feet will be lost along the rim of Lake Borgne in 20 years. Bayou Dupre' is the only area where Lake Borgne and the MRGO have coalesced and, according to the 1998 Digital Orthophoto Quarter-Quadrangle (DOQQ) of the area, the opening between Lake Borgne and the MRGO is approximately 550 ft wide. If the shoreline continues to erode at this rate, the opening at Bayou Dupre' will be 2,300 feet across in 20 years.

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<sup>1</sup> Construction is Phase 2 of the project and includes project and contract management, supervision and inspection, post-construction biological monitoring, operation, maintenance, repair, replacement, and rehabilitation and purchase of real estate.

<sup>2</sup> U.S. Army Corps of Engineers 404 permit for construction activities on Lake Borgne.

In August 2005, U.S. Geological Survey (USGS) revised the estimated shoreline erosion rates using the latest methodologies being utilized for CWPPRA shoreline protection projects. The new rate at Shell Beach is estimated to be 5-7 ft/yr, and 7-9 ft/yr at Bayou Dupre'. The revised rates were based on 1990 and 2004 imagery and do not reflect the effects of hurricanes Katrina and Rita. Much of the shoreline loss is associated with cold fronts.

**1.3 Preferred Alternative.** The preferred project alternative is the *Combination Rock Breakwaters and Steel Sheet Alternative*. The proposal would construct a nearly continuous rock breakwater along the +0.5 ft North American Vertical Datum (NAVD88) contour on designated shoreline sections of Lake Borgne at Bayou Dupre' and Shell Beach. The construction would extend approximately 17,000 ft from Doulluts Canal to Fort Bayou, 6,643 ft to the west of Bayou Dupre', and 4,418 ft to the southeast of Bayou Dupre' (Figures 2 and 3). A steel sheet pile structure will tie the proposed shoreline breakwater to the existing offshore ACE rock breakwater along the MRGO. At Shell Beach, the proposed rock breakwater will tie into the existing rock breakwater surrounding the perimeter of Fort Beauregard. The only opening in the breakwater will be along the mouth of Bayou Yscloskey and across the Tennessee Gas Pipeline right-of-way. End-on-construction, which will be used along the former naval base at Shell Beach to avoid the debris in the area, does not require flotation access since all activities will be within the breakwater footprint. A temporary flotation channel will be excavated along the shoreline to facilitate construction and maintenance of the rock breakwater. Approximately 281,461 cubic yards (cy) of spoil will be deposited on the lake side of the flotation channel and graded down into the flotation channel after construction or maintenance of the rock breakwater is complete.

**1.4 Purpose and Need for Action.** The purposed project is needed to halt the retreat of the Lake Borgne shoreline, the loss of marsh in the vicinity of Shell Beach and Bayou Dupre', and enhance fish and wildlife habitat. The marshes separating the MRGO from Lake Borgne are broken by many ponds and are suffering from both shoreline and bank erosion in the Shell Beach and Bayou Dupre' areas. The MRGO, with its direct connection to the Gulf of Mexico, brings high salinity water and increased tide levels and storm surges far into interior wetlands.

**1.5 Project Benefits and Potential Adverse Impacts.** The narrow marsh rim between MRGO and the Lake Borgne shoreline protects the communities of Shell Beach, Yscloskey, and Hopedale from direct exposure to lake wave energies and storm surge, and provides habitat for fish and wildlife. The proposed project would protect 95 ac along the Shell Beach and approximately 70 ac along the Bayou Dupre'. This acreage represents the projected loss over 20 years from shoreline retreat at a rate estimated at 10 ft/yr.<sup>3</sup> The proposed project will directly protect about 192 ac of wetlands and shallow water bottoms, of which 165 ac are vegetated wetlands. The reduction in the loss rate is estimated to be 100 percent over the life of the project (Table 1). Acres excavated for flotation access and channels would be 23.1 ac for Bayou Dupre' and 36.7 ac for Shell Beach. The area used for storage of dredged materials would be 8.97 ac and 20.5 ac for Bayou Dupre' and Shell Beach, respectively. The dredged flotation channel

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<sup>3</sup> Wetland Value Assessment (WVA) - November 2005.

would be back-filled to its natural state upon completion of construction and maintenance events. The breakwater rock structure would permanently replace 2.4 ac of existing bottom habitat and the steel sheet structure would replace 0.85 ac of existing bottom habitat. Placement of the stone rock dike on land/marsh will permanently disturb 15.8 acres.

## 2.0 ALTERNATIVES

Three alternatives were considered, No-action, Nonstructural (such as laws, restrictions, and moratoriums), and Structural (such as siphons, weirs and dams, creative use of spoil, introduction of sediment, hydraulic filling, fixed structures, variable structures, levees, flood gates, drainage canal, and pumps). Since the nonstructural measures alone are not adequate to achieve the purpose and need of the proposed action, they were not given further consideration. The structural measures, designed to abate or reverse wetland deterioration in St. Bernard Parish, are similar to the successful structural projects that have been used to protect shoreline erosion and create marsh.

**2.1 No-action Alternative.** Under the No-action Alternative, the project would not be built, allowing the Shell Beach and Bayou Dupre' shorelines to continue to retreat, and facilitating the continued fragmentation of the marshes on both the lakeside and the ship channel side between the MRGO and Lake Borgne. The loss of wetlands and wildlife habitat at both of these sites would continue, changing the habitat from marsh species to open water species.

**2.2 Design Alternatives.** Four design alternatives were evaluated using similar criteria in the preliminary design in order to maintain a consistent comparison of the cost estimates. The original design called for an offshore breakwater which would protect existing marsh, create marsh from sediment dredged from the flotation channel, and form marsh from sediment accretion behind the offshore breakwater. Studies, however, revealed that rock could not be placed at the initially preferred alignment along the -5-ft contour, and that soils along the -2-ft contour secondary alignment would not support the weight of rock (with the exception of a few stretches) due to high settlement rates. A second investigation recommended that the riprap material be placed at the marsh edge where soil bearing capacities were more suitable and minimal settlement would occur.

All of the design alternatives used the same alignment along the approximate +0.5 foot NAVD88 contour except at the mouth of Bayou Dupre', where it traverses along the shallowest route and connects to the existing ACE breakwaters on either side. The top elevations of the alternatives were all set at +2.0 ft NAVD88. At the mouth of Bayou Dupre', the top elevation was set at the deepwater wave height of 2.5 ft NAVD88 because the bathymetry deepens as it approaches the MRGO. For those design alternatives which included rock breakwaters, the crown elevations for the initial and maintenance lifts were adjusted for the bearing load of the rock profile, the allowable bearing capacity of the soil, and preliminary settlement predictions.

**2.2.1 Segmented Concrete Panel Alternative.** This alternative would use 16 inch (in) by 16 in by 30 ft piles, and 21 ft panels of varying lengths depending on the topography and bathymetry used in the design. The total construction cost for this alternative is estimated to be \$17.3

million, with a 15 percent contingency, and includes flotation, geotextile, scour berm, and maintenance costs.

2.2.2 Steel Sheet Pile Alternative. This alternative would use standard PZ-27 piles of varying lengths depending on the topography and bathymetry used in the design. The total construction cost for this alternative is approximately \$32 million, with a 15 percent contingency, and includes 35-ft soldier piles, scour protection, flotation, and maintenance costs.

2.2.3 Rock Breakwater Alternative. This alternative would set three lifts at the mouth of Bayou Dupre', and two at a crown elevation of +4.0 foot NAVD88 and crown width of 4 ft with 2:1 side slopes to maintain adequate protection against the deep water wave action and consolidation settlement. The volume of rock required to construct the two lifts would be about 300,000 tons. The total construction cost for this alternative is approximately \$14.3 million with a 15 percent contingency, and includes flotation, geotextile fabric and maintenance lifts.

2.2.4 Combination Rock Breakwaters and Fiberglass Sheet Alternative. This alternative would set the crown elevation of the breakwater at +2.0 ft NAVD88. The structure would be a back-to-back fiberglass sheet pile structure set at a crown elevation of 2.5 foot NAVD88, interconnected by tie rods, backfilled with sand to mean water level, and capped with geogrid composite and 250 pounds of class stone. Fiberglass was initially chosen for the sheet pile material because it is stronger than vinyl and more economical than steel, rock or concrete. This alternative was replaced by the steel sheet pile alternative because the structural limitations of the fiberglass sheet pile were exceeded due to changes in bathymetry resulting from Hurricane Katrina.

2.2.5 Combination Rock Breakwaters and Steel Sheet Alternative. This alternative was determined to be the preferred alternative due to the expected longevity and relatively lower construction costs. A continuous rock breakwater would be constructed along the designated shoreline section of Lake Borgne at Bayou Dupre' and Shell Beach. A steel sheet pile structure would tie the proposed breakwater into the existing offshore ACE rock breakwater along the MRGO. At Shell Beach, the proposed rock breakwater would tie into the existing rock breakwater which surrounds the perimeter of Fort Beauregard. The only opening in the breakwater would occur along the mouth of Bayou Yscloskey and across the Tennessee Gas Pipeline right-of-way. End-on-construction would be constructed along the former naval base at Shell Beach to avoid the debris in the area and would not require flotation access because all activities would be within the footprint of the breakwater. A temporary flotation channel would be excavated along the shoreline in order to facilitate construction and maintenance of the rock breakwater. Approximately 281,461 cy of spoil would be deposited on the lake side of the flotation channel and graded down into the flotation channel after construction or maintenance of the rock breakwater is complete. The design life for the proposed project is 20 years. The total construction cost for this alternative is estimated to be \$11.6 million, which includes a 15 percent contingency, and includes scour protection, flotation, geogrid composite, settlement plates, warning signs, walers, tie rods, and sand backfill.

2.2.6 Additive Alternative #1. In order to avoid any adverse impacts to cultural resources located in the Bayou Dupre' area, the Additive Alternate #1 (approximately 2,000 ft of onshore

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breakwater) was originally proposed at the 30 percent design level conference, but was removed from the eastern-most end of the reach (Figure 4).

**2.2.7 End-On-Construction.** End-on-construction would not require flotation access because all activities will be performed within the footprint of the breakwater. Equipment and materials access would be provided to the shore from flotation channels on adjacent construction reaches. Approximately 1,534 ft of rock breakwater along the former naval base located at Shell Beach would be constructed using end-on-construction in order to avoid the debris in the area.

**2.5 Recommendation.** Based on a comprehensive literature review, site-specific data, and project engineering and environmental reports, EPA Region 6 has determined that there are no significant adverse environmental impacts anticipated from the implementation of the *Combination Rock Breakwaters and Steel Sheet Alternative* project as proposed. This finding supports the recommendations of the CWPPRA Task Force and LDNR. The long-term protection and enhancement of the project area is expected to be beneficial to wetlands, fisheries, wildlife, recreational, and cultural resources as well as restoration of natural structural framework of the narrow strip of marsh that separates Lake Borgne from the MRGO.

### 3.0 AFFECTED ENVIRONMENT

**3.1 Soils.** Based on information in the Soil Survey of St. Bernard Parish, Louisiana, soil types present in the Shell Beach project area include Clovelly muck, between Bayou Yscloskey and Fort Bayou, and Fausse clay, primarily along the shore between Bayou Yscloskey and Doulluts Canal. The soil type in the Bayou Dupre' project area is Clovelly muck. Clovelly muck is characteristic of brackish marshes and shallow open water areas flooded most of the time and wet throughout the year. It is very poorly drained, very fluid, and slightly saline organic soil. It is neutral to moderately alkaline with a pH ranging from 6.6 to 8.4. The surface layer is dark brown extending about 50 inches; the underlying layer is very fluid gray clay extending about 70 inches. Clovelly muck soil is well suited for wetland wildlife habitat and, combined with the brackish marshes and shallow open water areas, they support marine life of the Gulf of Mexico. Fausse clay is a very poorly drained, firm mineral soil found in swamps on subsided natural levees of distributaries of the Mississippi River. It is neutral to strongly alkaline, with a pH ranging from 6.1 to 9.0. The surface layer is about 5 inches thick and consists of dark grayish brown, very fluid clay in the upper part, and dark gray, firm clay in the lower part. The underlying material extends about 60 inches and is gray, firm clay. Fausse clay is used as habitat for wetland wildlife. None of the alternatives would have an impact on soils.

**3.2 Water Quality.** Lake Borgne is located in the Eastern Louisiana Coastal USGS Cataloging Unit 0809023. Based on the condition and vulnerability indicators<sup>4</sup>, the overall Index of

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<sup>4</sup> Condition indicators are designed to show existing watershed health across the country and include such things as water meeting state or tribal designated uses, contaminated sediments, ambient water quality, and wetland loss. Vulnerability indicators are designed to indicate where pollution discharges and other activities stress the watershed and could result in problems in the future. Activities in this category include such things as pollutant loads discharged in excess of permitted levels, pollution potential from urban and agricultural lands, and changes in human population levels. The more serious condition

Watershed Indicators (IWI) score is 3, which indicates Less Serious Water Quality Problems and Low Vulnerability to Stressors, which indicate aquatic conditions below State or Tribal water quality goals with problems revealed by other indicators. Watersheds with Lower Vulnerability to Stressors are watersheds where data suggest that pollutants or other stressors are low and where there is lower potential for declines in aquatic health.

*303(d) Listed Waters* - Under Section 303(d) of the Clean Water Act, each state must prepare a list of waters that are not meeting their water quality standards. These lists must be submitted to EPA for review and approval every April of even years (e.g. 1996, 1998). Total Maximum Daily Loads (TMDLs) are then established from the most recently approved list. For Lake Borgne, ID LA-042001-1998, the parameter of concern is pathogens. The priority for TMDL development is 5.

**3.2.1 No-action Alternative.** The No-action Alternative would allow the present conditions to continue, resulting in increased wave energies, greater erosion, and eventual breaching. The continued deterioration of the existing marshes could potentially contribute to an increase in turbidity and high-energy tidal surges allowing higher salinity waters into interior bay waters. The entire project area would eventually be converted to open water.

**3.2.2 Combination Rock Breakwater and Steel Sheet Alternative.** This alternative would have no long-term adverse impact on present conditions. However, short-term adverse impacts due to increased turbidity from the placement of the rock structure and dredging the flotation channel could occur during project construction. It is expected that turbidity levels would return to normal shortly after completion of construction. It is unlikely that this option would have any effect on pathogens.

**3.3 Climate and Air Quality.** Climate in the project area is subtropical and is influenced by the nearby lakes, streams, and the Gulf of Mexico which modify the relative humidity and temperatures throughout the year. Summers are long and hot with high humidity with average daily temperatures ranging from 81 degree Fahrenheit (°F) to a maximum of 90 °F. Winters are influenced by cold, dry polar air masses moving southward from Canada, with the average daily temperatures ranging from 53 °F to a minimum of 43 °F. Annual precipitation averages 55 inches. The area is subject to frequent tropical storms and hurricanes.

St. Bernard Parish is currently classified in attainment for all National Ambient Air Quality Standards (NAAQS) and the air quality is good. National and state ambient air quality standards for specific criteria pollutants were developed to protect public health, safety, and welfare as a result of the Federal Clean Air Act (CAA) of 1970. The CAA Amendments of 1990 mandated a program to improve air quality and maintained the NAAQS. This program involves ongoing monitoring and reporting from which regions are classified as to their attainment status with regard to each criteria pollutant.

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indicator for this watershed is the Wetland Loss Index. The three vulnerability indicators identified as more serious are Wetland Aquatic Species at Risk, Urban Runoff Potential, and Estuarine Pollution Susceptibility Index.

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3.3.1 No-action Alternative. This alternative would have no impact on present air quality conditions.

3.3.2 Combination Rock Breakwater and Steel Sheet Alternative. This alternative would have no long-term adverse impact on present conditions. Minor temporary impacts due to emissions from dredging equipment could occur during construction. It is expected that exhaust emissions from dredging equipment would be limited to the construction phase of the project, but would be quickly dissipated by prevailing winds. The total volatile organic compound emissions for this project during construction is anticipated to be well below the de minimis level of 100 tons per year. Therefore, this option conforms to the Louisiana State Implementation Plan.

3.4 **Wetland**. Between 1932 and 1990, approximately 7,300 acres of wetlands were lost in the South Lake Borgne mapping unit. From 1983-1990, data from the Coast 2050 Plan for the South Lake Borgne mapping unit indicates a wetland loss rate of approximately 0.33 percent per year, and approximately 0.51 percent per year from 1974-1990. This loss rate includes natural loss and losses due to shoreline and canal erosion. In 1990, this mapping unit consisted of 16,600 acres of marsh. Subsidence in the area is estimated at 1.1-2.0 ft per century. It is projected that about 3,310 acres of wetlands will be lost by 2050 for this mapping unit.

Lake Borgne shoreline retreat rates at Shell Beach are estimated at 15 ft/yr according to Louisiana Geological Survey data cited in the CWPPRA Restoration Plan. The narrow strip of marsh between Lake Borgne and the MRGO in the vicinity of Bayou Dupre' is disappearing. In fact, this is the only area in which Lake Borgne and the MRGO have coalesced. The opening between the Lake and the MRGO is estimated to be approximately 550 feet wide as measured on the 1998 DOQQ of the area. Assuming the shoreline continues to erode at the historical rate, the opening at Bayou Dupre' will be 2,300 feet across in 20 years.

In August 2005, USGS revised its estimates of shoreline erosion rates using the latest methodologies currently being utilized for all CWPPRA shoreline protection projects. The shoreline erosion rates at Shell Beach are now estimated at 5-7 ft/yr, and 7-9 ft ft/yr at Bayou Dupre'. Much of this shoreline loss is associated with cold fronts. The revised shoreline erosion rates were based on 1990 and 2004 imagery and do not reflect the effects of hurricanes Katrina and Rita.

3.4.1 No-action Alternative. Common plant species observed in the area include: *Spartina alterniflora*, *Spartina patens*, *Spartina cynosuroides*, *Phragmites australis*, *Distichlis spicata*, and *Iva frutescens*. Without the protection of the breakwaters, the vegetated marshes will be converted to open water.

3.4.2 Combination Rock Breakwater and Steel Sheet Alternative. Implementation of the proposed action, shoreline erosion and wetland loss and protect 165 acres of vegetated marsh over the 20-year life of the project.

3.5 **Wildlife and Fisheries**. The proposed project sites border two mapping units in Region 1 of the 1998 Coast 2050 Plan, South Lake Borgne mapping unit and the Lake Borgne mapping unit. For the South Lake Borgne mapping unit, the area covered in this unit is important to many

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species of wildlife and fishes, including migratory and resident waterfowl, wading and water birds, furbearers, shellfish, and many recreational and commercial species of fish. The Federally listed Gulf of Mexico sturgeon has been reported in Lake Borgne and the Federally listed endangered brown pelican can be commonly found foraging and resting throughout this unit. Lake Borgne is particularly important as the site of some of Louisiana's prime oyster grounds. The lake supports an estuarine assemblage of fishes. Red drum, spotted sea trout, blue crab, brown shrimp, and white shrimp are commercially important species found in the lake.

Populations of red drum, black drum, spotted sea trout, Gulf menhaden, southern flounder, American oyster, white shrimp, brown shrimp, blue crab, and Spanish mackerel have been steady for the last 10-20 years. Gulf menhaden and Spanish mackerel populations are expected to remain steady through 2050, while the others are expected to decline. Populations of seabirds, wading birds, shorebirds, raptors, and marsh resident and migrant birds have been steady for the last 10-20 years but are projected to decline through the year 2050. Furbearer and American alligator populations have declined over the last 10-20 years and are expected to do so through 2050. Brown pelican populations have increased in the recent past and are expected to do so through 2050.

Most of the estuarine species spawn offshore, and the larvae migrate either freely or by currents into the estuarine marshes. Once inshore, the larvae reside in the saline, intermediate, or brackish marshes, depending on the species' salinity tolerance and food availability. The interface between the marsh and the water's edge creates a habitat where larval and juvenile fishes can find cover, food, and favorable environmental conditions (water depth, temperature, dissolved oxygen, current speed, and turbidity). The interior marsh provides a stable habitat that resists fluctuating water levels, salinity, temperature, and water movement.

This stable nursery habitat allows species to maintain their position in the estuary until they become adults. The larvae of many species that spawn during the fall and winter months remain in the estuary throughout the spring and summer months. During the warmer months, larval and juvenile fish and shellfish species experience the most rapid growth. The marshes are critical to the successful completion of the life cycle of these species. Additionally, the detritus provided by these marshes forms the basis of the food chain for many fish and shellfish species. The shallow estuarine open water habitat along Lake Borgne and the MRGO provide an interior habitat essential to fish, shellfish, and wildlife species. This area represents the nursery habitat for estuarine-dependent species, which utilize shallow open water for nursery grounds. Fish species such as menhaden favor shallow open water to flooded marsh for nursery grounds in their larval and juvenile life stages. Much of the shallow estuarine open water offers refuge to fish, crabs, and shrimp when the water level drops causing these species to retreat from the flooded marsh to the remaining open water.

Many of the shallow estuarine ponds are isolated from adjacent water bodies. These ponds resist the fluctuating water levels, salinity, and temperature reflected in the adjacent water body. The salinity and temperature extremes experienced in isolated ponds, due to evaporation, rainfall, and sun radiation, however, may be much greater than those experienced by ponds which are connected to the adjacent water bodies by small natural marsh channels.

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Salinity. Historically, salinities in the project area were such that brackish marsh was the dominant habitat type. Since construction of the MRGO, these marshes have been subject to increased salinity due to the channel's direct connection to saline marine waters. An average annual salinity of 10 part per trillion (ppt) was utilized in the 1997 and 1999 WVAs for this project. Measurements taken at the project site in June 2000 indicated a salinity of 19 ppt. As project features of this project do not propose any salinity attenuation effect, there should be no change from the baseline condition with or without the project.

The MRGO channel has created an increase in the number of access points into the marshes for estuarine species. The access increase into the salt marsh habitat has benefited estuarine species, but the conversion of brackish and saline marsh to open water has reduced the amount of estuarine nursery habitat. Many larval fish and shellfish species travel this corridor from the Gulf of Mexico to the interior marsh habitats.

Water movement, from tidal fluctuation and ship wakes, has caused erosion along the banks of the MRGO. Bank erosion along the north bank of the MRGO has increased the number of shallow estuarine marsh ponds, further increasing the width of the channel. Interior marsh breakup is a result of increased water movement and subsidence. As the interior marsh breaks up, the amount of edge habitat available to estuarine species increases. However, as the breakup converts the interior marsh to open water, estuarine marsh habitat declines.

**3.5.1 The No-action Alternative.** The No-action Alternative may not pose an eminent danger to the fish and wildlife resources in the area, as construction would not take place. There is a continual prolonged risk as the shoreline continues to recede and the marsh and wetland habitat continues to degrade. As interior marsh habitat decreases to open water over time, species would change.

**3.5.2 Combination Rock Breakwater and Steel Sheet Alternative.** The shoreline protection is expected to preserve the marshland and areas of intertidal emergent vegetation. The wetlands protected would provide a diversity of habitat foraging, breeding, spawning, and cover habitat for a greater variety of adult and juvenile fisheries. Nutrients and detritus would be added to the existing food web, providing a positive benefit to local area fisheries. According to NOAA, access features such as fish dips would not be necessary even though a revetment would change the type of edge habitat, it would not necessarily restrict fish access behind it

**3.6 Essential Fish Habitat (EFH).** Project evaluation included an examination of habitat considered to be essential for fisheries as established under the provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), intended to promote the protection, conservation, and enhancement of essential fish habitat (EFH). The MSFCMA defines EFH as those waters and substrates necessary to federally managed fish species for spawning, breeding, feeding or growth to maturity of specific species depending upon life stage (Table 3). Primary categories of EFH in the project vicinity include marsh edge, inner marsh, mud bottoms and oyster reef in Lake Borgne. Specifically, brown and white shrimps in the postlarvae, juvenile and sub-adult life stage, as well as the white shrimp adults, inhabit marsh edge, submerged aquatic vegetation (SAV), marsh ponds, and inner marsh. The brown shrimp

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sub-adults live in estuarine mud bottoms and marsh edge. Red drum in the post-larvae/juvenile life stage inhabits SAV, estuarine mud bottoms and the interface between marsh and water. The sub-adults of the species live in estuarine mud bottoms and oyster reefs (Table 2). All portions of the proposed project area have been identified as EFH for various life stages of white and brown shrimp and red drum.

**3.6.1 The No-Action Alternative.** Under the No-action Alternative, the proposed action would not be built. Without the protection of the breakwaters, the salt marsh would continue to erode. EFH will decrease over time, resulting in the decline in fisheries.

**3.6.2 Combination Rock Breakwater and Steel Sheet Alternative.** The shoreline protection is expected to preserve the marshland and areas of inter-tidal emergent vegetation by 100 percent. The protected wetlands would provide a diversity of habitat foraging, breeding, spawning, and cover habitat for a greater variety of adult and juvenile fisheries. Nutrients and detritus would be added to the existing food web, providing a positive benefit to local area fisheries. Inclusions of fish dip openings will not be needed to facilitate fish access and water exchange.

**3.7 Threatened and Endangered Species.** The two species of concern in the area are the endangered West Indian manatee (*Trichechus nanatus*) and the threatened Gulf sturgeon (*Acipenser oxyrinchus desotoi*). Manatees have been sighted within the MRGO, and are known to travel long distances up coastal waterways from the Gulf of Mexico. On July 9, 2001, a manatee was observed passing safely through the Inner Harbor Canal Navigation Lock and into the Mississippi River. Manatees are usually within Louisiana coastal waterways only during the warm weather/warm water months. The Biological Assessment (BA), "*Impacts of Navigational Channel Dredging on the Gulf Sturgeon*", dated March 15, 2001, report that no recent catches or sightings of Gulf sturgeon within the MRGO have been found in available resources. The Louisiana Department of Wildlife and Fisheries conducted studies in Louisiana coastal waters from 1990 to 1993. Reports of incidental catches and sightings of sturgeon show that Gulf sturgeon exists within several coastal waterways in southeast Louisiana, including Lake Borgne.

On March 19, 2003, the FWS and NOAA Fisheries published a final rule in the Federal Register (Volume 68, No. 53) designating critical habitat for the Gulf sturgeon in Louisiana, Mississippi, Alabama, and Florida. Portions of the Pearl and Bogue Chitto Rivers, Lake Pontchartrain east of the Lake Pontchartrain Causeway, all of Little Lake, The Rigolets, Lake St. Catherine, and Lake Borgne within Louisiana were included in that designation. The primary constituent elements essential for the conservation of Gulf sturgeon are those habitat components that support feeding, resting, sheltering, reproduction, migration, and physical features necessary for maintaining the natural processes and include:

- abundant prey items within riverine habitats;
  - riverine spawning sites;
  - riverine aggregation areas, also referred to as resting, holding and staging areas;
  - a flow regime (i.e., the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time);
  - water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and
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- other chemical characteristics;
- sediment quality, including texture and other chemical characteristics; and
- safe and unobstructed migratory pathways (e.g., a river unobstructed by a permanent structure, or a dammed river that still allows for passage).

The manatee population has declined in number due to collisions with boats and barges, entrapment in flood control structures, poaching, habitat loss, and pollution. Cold weather and outbreaks of red tide may also adversely affect these mammals. For the gulf sturgeon, habitat alterations caused by water control structures that limit and sometimes prevent spawning, create poor quality water, and lead to over-fishing have negatively affected the population of this species. There is potential for manatees and sturgeon to be within the vicinity of the proposed project.

**3.7.1 The No-action Alternative.** Under the No-action Alternative, the proposed action would not be built. Without the protection of the breakwaters the vegetative marsh would continue to erode, and habitat will decrease over time.

**3.7.2 Combination Rock Breakwater and Steel Sheet Alternative.** Implementation of the proposed project is not likely to adversely impact the West Indian manatee or the Gulf sturgeon. Halting the loss of vegetative marsh would likely protect the available habitat for these species. Construction will be done within the guidelines set forth by the FWS and the LDWF to insure protection of critical habitat and protection of these species.

*West Indian Manatee.* The primary potential impact to the West Indian manatees would include possible collision with service vessels and noise in the water from the dredge operation or service vessels. The dredge and service vessels would be required to have a qualified observer on board to sight the manatees while in transit so the manatees or other marine mammals could be avoided. No collision fatalities are expected and the proposed project is expected to have negligible adverse effect on the West Indian manatee.

*Gulf sturgeon.* The shoreline protection project is expected to preserve marsh land and areas of intertidal emergent vegetation. The protected wetlands would continue to provide a diversity of habitat. This alternative will not impact enough habitat to adversely modify critical habitat to the extent it would jeopardize the Gulf sturgeon. To reduce any risk to the Gulf sturgeon to a minimum, habitat alteration during construction should be minimized to the greatest extent possible.

**3.8 Recreation.** Recreation in the area is generally oriented towards hunting and fishing. The natural and recreational resources of the project area provide wide and varied opportunities for outdoor enjoyment. Recreational activities taking place in the MRGO, Lake Borgne and adjacent marshes, may include boating, hunting, fishing and natural and cultural study. The project area is an area of vital importance as a fishery nursery ground, waterfowl wintering and hunting area. Recreational fishing is by far the most popular activity in the management area because of the access to water bodies, bayous, and the marsh. Small game hunting is also popular due to the abundance of habitat and the wide range of species available to the hunter.

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3.8.1 No-action Alternative. Recreational use within the project area would continue at its present level. The marshes surrounding the project area provide numerous areas for hunting and fishing opportunities. However, over time these marshes would erode and subside, converting to open-water areas. Continued marsh loss translates into less edge and estuarine marsh habitat available to fish. Lost nursery and breeding grounds translate into less productive fishing in the future.

3.8.2 Combination Rock Breakwater and Steel Sheet Alternative. The recreational environment in and around the project area would experience limited short-term disruption imposed by the physical size and working activities of the floating dredge facility and barge traffic. Dredging activities associated with construction of the flotation channels would increase turbidity in the area of work and in the vicinity of the discharge pipes. This turbidity may disrupt water-oriented recreational activity occurring within the vicinity; however, these adverse impacts would be temporary and short-lived. Positive long-term benefits would be the sustainability of the marsh. This marsh and vegetation would provide shelter and habitat for wildlife. The rock dike construction will reduce further bank erosion, and create areas for fish habitat, breeding and feeding areas.

#### 4.0 OTHER ENVIRONMENTAL CONSIDERATIONS

4.1 **Oyster Leases**. There are six oyster leases in the project area, which encompasses 338 acres (Figures 2 and 3). The leases have a lease value of \$91,200 and a standing crop value of \$147,959, for a total value of \$239,159. The state is currently evaluating its oyster lease policy. No construction will take place until there is a resolution between the State and lease owners.

4.2 **Cultural Resources**. Letters dated June 25, 2001, and June 19, 2002, were received from the State of Louisiana, Department of Culture, Recreation & Tourism, Office of Cultural Development, Division of Archaeology, State Historic Preservation Officer (SHPO), identifying three recorded archaeological sites (16SB83, 16SB43 and 16SB44) located in the Shell Beach area and six sites (SB85, SB71, SB148, SB40, SB39, and SB140) located in the Bayou Dupre' area, respectively. Site 16SB83, Fort Proctor (also known as Fort Beauregard), is listed on the NRHP. The NRHP eligibility of sites 16SB43, located outside of the area of potential effect (APE) and 16SB44 was unknown. Based on aerial photographs taken after hurricane Katrina, SB85, Martello Castle is a pile of rubble and was not assessed for NRHP eligibility. Sites SB71 and SB148 were determined to be ineligible for NRHP listing. Sites SB39, SB40 and SB140 were identified as eligible for listing on the NRHP. However, site SB140 is located outside of the APE. Human remains had been encountered at site SB39.

A Phase I Terrestrial and Submerged Cultural Resources Survey was conducted to document and assess cultural resources (archaeological sites and standing structures) within the project's APE. The investigation located a single new archaeological site (SB154) and documented standing structures at site SB44. Because of this survey, two sites SB40 and SB44 were assessed as not meeting the eligibility criteria for listing on the NHRP. Sites SB39 and SB154, however, were assessed as meeting the NHRP eligibility criteria. SHPO agreed with the

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survey findings in their letter of August 20, 2004, to LDNR. The Additive Alternate #1 presented at the August 2005 30 percent design conference, and as shown on the 30 percent level plans was deleted from the eastern-most end of the reach. By maintaining a sufficient buffer distance from these areas (SB39 and SB154), any impacts due to the construction of this project will be avoided.

**4.3 Socio-economics and Environmental Justice.** In accordance with Executive Order 12898 on Environmental Justice (EJ), a basic EJ analysis was performed to develop an EJ index for the proposed project. The analysis is based on the percentage of minority people, the percentage of economically distressed households earning less than \$15,000 per year, and the population within a one-half and four mile radius of the site in comparison with the percentage from the state. The EJ index indicators range from 1 where the factors affecting minorities are considered to be in balance when compared to the state average, to 100 where the minorities are considered to be grossly unbalanced when compared to the state average. For Shell Beach, the index for the 1 square mile area was calculated to be "0" and for the 50 square mile area calculated to be "6". For Bayou Dupre', the index for the 1 square mile area was calculated to be "0" and for the 50 square mile area calculated to be "1". The analysis was conducted prior to hurricanes Katrina and Rita when there were approximately 528 people living within a 50 mile radius of the proposed Shell Beach project site, and approximately 2,766 people for Bayou Dupre'.

#### **4.4 Coastal Zone Management, Prime Farmlands, and Floodplains**

**4.4.1 Coastal Zone Management (CZM).** In order to comply with CZM requirements, the project will need a Coastal Use Permit (CUP) prior to construction, which is issued by the LDNR. Applications for the CUP and ACE 404 permits have been submitted. A Joint Public Notice for both permits will be issued upon completion of this EA.

**4.4.2 Floodplains.** The Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps delineate the 100-year Special Flood Hazard Areas, designated "A" or "V" zones. A-zone Special Flood Hazard Areas are areas that have a 1 percent chance of experiencing a 100-year level flood in any given year. Coastal zone areas are designated "V" zones in which structures are subject to damage from both flooding and significant wave action. According to FEMA, the proposed project is designated to be in a "V" zone area. This area is subject to wind and wave action along with flooding. It does not appear that the proposed project would have a negative affect on the floodplain.

**4.4.3 Prime Farmland/Overgrazing.** According to the Natural Resources Conservation Service (NRCS), it does not appear that this proposed project will impact any of their work in the vicinity. Further, it is not believed that the project will have an adverse effect on the surrounding environment when completed if appropriate erosion control measures are taken during construction. No prime, unique, or statewide important farmlands will be impacted. NRCS also states that there are no livestock currently grazing in the area, nor a potential for grazing once the project is installed and overgrazing is considered to be a problem for the project area.

**4.5 Hazardous, Toxic, and Radioactive Waste (HTRW).** HTRW activities include those activities undertaken for the EPA's Superfund program, the Defense Environmental Restoration Program, including Formerly Used Defense Sites (FUDS) and Installation Restoration Program sites at active Department of Defense facilities, HTRW actions associated with Civil Works projects, and any other mission or non-mission work performed for others at HTRW sites. For the purposes of Unexploded Ordnance (UXO) support, HTRW activities during the investigative/design phase of HTRW project on a site with known or UXO with unknown fillers require anomaly avoidance procedures. HTRW activities during the remedial action phase (construction) of HTRW project on a site with known or UXO with unknown fillers may require either standby support or subsurface removal.

Shell Beach was an anti-aircraft gunnery range used during World War II (Figure 5), generally located at 29° 52' 01" north latitude and 89° 40' 01" west longitude. These ranges were oriented to fire out over the water at aerial targets towed by a tow aircraft. The inventory property report for this property lists it as an eligible Formerly Used Defense Sites (FUDS) property Number A06LA0323, but no hazards were found and the site is considered complete, no further action to be taken. The limit for an eligible ordnance project along a shoreline is 100 years from the high tide line. Any ordnance at this property would be located in the water beyond the current limit of 100 years, which makes any project ineligible. End-on-construction along this former naval base will ensure avoidance of the debris in the area.

**4.6 Cumulative Impacts.** Potential cumulative impacts would be the aggregate impacts to the environment resulting from the proposed action in combination with other ongoing actions, and actions being considered within the reasonably foreseeable future. The proposed action is part of an effort under CWPPRA to create, protect, restore and enhance wetlands in coastal Louisiana. CWPPRA provides Federal funds for planning and implementing of such projects. ACE has two infrastructure projects inside or bordering the South Lake Borgne mapping unit. Bayous La Loutre, St. Malo, and Yscloskey were improved to provide a navigation channel from Bayou St. Malo to Hopedale. The MRGO, a navigation channel from New Orleans to the Gulf of Mexico, was constructed as well. There are no roads or railroads, about 17 miles of pipelines, and 12 oil and/or gas wells in this unit. The Lake Borgne mapping unit, there are no major Federal, State, or parish infrastructure or any roads, railroads, or pipelines. There are 61 oil and/or natural gas wells and one industrial groundwater intake in this unit.

The MRGO, constructed in 1963, has drastically changed the landscape of the St. Bernard Parish wetlands not only by its large foot print, which eliminated thousands of acres of wetlands, but also by altering salinity and tidal regimes. For now, relatively little is being done to address the ongoing degradation caused by the MRGO. Future MRGO closure/modification decision will take years. A limited amount of rock-buttressed dredged spoil has been used in the past to protect small portions of the highly vulnerable channel shore, and speed restrictions have been proposed to reduce wake erosion. The proposed action is expected to have long-term beneficial cumulative impacts. Protecting wetlands within the proposed project areas benefits the significant resources described in the EA. Protecting the shorelines and wetlands between Lake Borgne and the MRGO would sustain valuable breeding, nesting, foraging, and cover habitat for a variety of fisheries and wildlife species. The new result would be sustaining bio-

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diversity and productivity. The ACE is proposed to place a rock breakwater (18,820 linear feet) along the southern shore of Lake Borgne starting at the east bank of Doullut's Canal and proceeding east to the south bank of Jahncke's Ditch and to construct a 14,360 linear-foot rock breakwater along the north bank of the MRGO starting at the east bank of Doullut's Canal and proceeding east to the west bank of the mouth of Lena Lagoon. These projects will include flotation channels to be dredged parallel to and toward the waterside of the rock breakwaters as needed.

**4.7 Unavoidable Adverse Effects.** The primary unavoidable adverse effects are the immediate impacts from construction related sediment excavation and deposition on the non-mobile benthic organisms in areas adjacent to specific project features, minor and temporary disturbance to adjacent wetlands, water and air quality. The effects on air quality and the noise generated by the proposed project will be of a temporary nature.

**4.8 Relationship between Local, Short Term Use of the Environment and the Maintenance/Enhancement of Long Term Beneficial Uses.** All structural and non-structural alternatives have short-term localized impacts during construction; yet offer highly significant long-term environmental benefits. The proposed project is a protection of shoreline action and would protect approximately 95 ac of emergent marsh from direct loss due to Lake Borgne shoreline retreat from Doulluts Canal to Fort Bayou. For Bayou Durpe', the proposed project would protect 70 ac of existing emergent marsh and prevent further coalescence of Lake Borgne with the MRGO resulting from the shoreline erosion of Lake Borgne.

**4.9 Irreversible and Irretrievable Commitment of Resources.** The irreversible and irretrievable committed resources would be labor, materials, wear on machinery, monies spent, and energy expended for implementation of the restoration action.

## **5.0 PROPOSED MITIGATION**

**5.1 Mitigation Criteria.** The following mitigations will be necessary to ensure environmental protection, consistent environmental policy, and safety as required by the NEPA, or are recommended measures needed for compliance with 40 CFR 1500.2(f) regarding the requirement for Federal agencies to avoid or minimize adverse effects of their actions upon the quality of the human environment.

**5.2 Protection vegetation.** Access to or movement across the strip of marsh outside the defined project area shall generally be prohibited within vegetated areas for all personnel and equipment to protect existing vegetation. Vegetated areas shall not be used for equipment, personnel or material access or storage. The dredged fill shall be discharged within the designated areas in a manner that will minimize overflow of the dredged material from the bounds of its placement area.

**5.3 FWS 100-yard buffer zone.** All contract personnel associated with the project will be informed of the potential presence of manatees and the need to avoid collisions with manatees, which are protected under the Marine Mammal Protection Act of 1972 and the Endangered

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Species Act of 1973. All construction personnel are responsible for observing water-related activities for the presence of manatee(s). Temporary signs will be posted prior to and during all construction/dredging activities to remind personnel to be observant for manatees or within vessel movement zones. At least one sign will be placed where it is visible to vessel operators. Siltation barriers, if used, will be made of material that will not entangle manatees, and will be properly secured and monitored. If a manatee is sighted within 100 yards of the active work zone, special operating conditions will be implemented, including: no operation of moving equipment within 50 feet of a manatee; all vessels will operate at no wake/idle speeds within 100 yards of the work area; and siltation barriers, if used, will be re-secured and monitored. Special operating conditions are no longer necessary once the manatee has left the 100-yard buffer zone around the work area on its own accord, but careful observations would be resumed. Any manatee sighting will be immediately reported to the FWS and the LDWF Natural Heritage Program.

**5.4 Summer dredging windows.** During the winter months, juvenile and adult Gulf sturgeon use estuarine and marine habitats for foraging activities. Sturgeon migrate to river mouths and upstream areas during the spring in search of spawning and resting habitat. They migrate back into the estuaries and marine habitats in the fall season in search of suitable benthic prey species, their primary source of food. To avoid impacts to the sturgeon during the fall and spring migrations all contract personnel will observe summer dredging windows and dredge from May 1<sup>st</sup> through September 30<sup>th</sup> only.

All contract personnel associated with the project will be informed of the potential presence of the Gulf sturgeon and take action to induce them to leave the immediate work area prior to dredging, regardless of water depth or time of year. If Gulf sturgeons are sighted, no dredging will be initiated until they have left the work area. During the no-dredging period, personnel will carefully observe the work area for presence of the Gulf sturgeon. If water turbidity makes such visual observations impossible, dredging work will proceed after the one-minute no-dredging period.

## **6.0 CONSULTATION AND PUBLIC PARTICIPATION**

Public involvement including input from the public, local, State, Tribal and Federal agencies is achieved through the Citizen Participation Group, and public meetings conducted during the project development and selection stages under CWPPRA. The project concept was originally proposed to the public at a nomination meeting held in 2000. An overview of the selected project was presented to the public in 2001. St. Bernard Parish was kept updated as project engineering and design progressed.

The public recognizes that the continued loss of coastal wetlands can ultimately result in the displacement of entire communities, the loss of occupational and recreational opportunities, and ultimately, the forfeiture of a unique culture and way of life. Passage of the Louisiana constitutional amendment establishing the Coastal Wetlands Conservation and Restoration Fund clearly overwhelmingly demonstrated public's overwhelming support to effectively address the

State's coastal land loss problem. This statutorily dedicated fund has provided a State funding mechanism for cost sharing this project.

Coordination has been maintained with each of the CWPPRA Task Force agencies and the LDNR. Consultation has been conducted with the FWS and LDWF, in accordance with the Endangered Species Act of 1973 and Fish and Wildlife Coordination Act. The EA has been prepared in coordination with the NMFS in determining categories of EFH and associated fisheries species within the project vicinity. Submittal of the EA is provided to initiate formal Federal consultation requirements pertaining to EFH under the MSFCMA. Federal, State, Tribal and local agencies, as well as other interested stakeholders, will receive a copy of this EA. Consultation has also been conducted with the Louisiana Department of Culture, Recreation and Tourism, State Historic Preservation Officer (SHPO) in accordance with the National Historic Preservation Act of 1966, and Archaeological and Historic Preservation Act of 1974. Since 2003, consultation has been conducted with the Chitimacha Tribe of Louisiana and the Mississippi Band of Choctaw tribes concerning two archeological sites, SB39 and SB154, known to contain human remains of the Mississippi Band of Choctaw and/or Chitimacha Tribe of Louisiana. Responses from the respective agencies with regard to the proposed action are included in Section 7.0.

U.S. Department of Agriculture, Natural Resources Conservation Service  
U.S. Army Corps of Engineers  
U.S. National Marine Fisheries Service  
U.S. Fish and Wildlife Service  
Federal Emergency Management Agency  
State Historic Preservation Officer  
Louisiana Department of Environmental Quality  
Louisiana Department of Natural Resources  
Louisiana Department of Wildlife and Fisheries  
National Audubon Society  
St. Bernard Parish Consolidated Government  
Chitimacha Tribe of Louisiana  
Mississippi Band of Choctaw

## 7.0 TABLES, MAPS, FIGURES, COMMENT LETTERS AND E-MAILS

Table 1 - Lake Borgne Shoreline Protection Project (PO-30) Habitat Analysis at TY0 and TY20

	Bayou Dupre' West	Bayou Dupre' East	Shell Beach	Bayou Dupre' and Shell Beach	Bayou Dupre' and Shell Beach	Bayou Dupre' and Shell Beach
	Acres TY0	Acres TY0	Acres TY0	Total Acres TY0 Existing Condition	Total Acres TY20 Future w/Project	Total Acres TY20 Future wo/Project
marsh	47	23	94	164	164	0
wetland shrub scrub			1	1	1	0
marsh water	6	5	16	27	27	192
Total	53	28	111	192	192	192

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Table 2 - Summary of EFH Requirements or Species Managed by the Gulf of Mexico Management Council

Species	Life Stage	System	EFH
Brown shrimp EFH: Apalachicola Bay to Mex.	eggs larvae postlarvae/juvenile subadults adults	Marine (M) M Estuarine (E) E M	<110 m, demersal <110 m, planktonic marsh edge, SAV, tidal creeks, inner marsh, mud bottoms, marsh edge <110 m, silt sand, muddy sand
White shrimp EFH: Suwannee River to Mex.	eggs larvae postlarvae/juvenile subadults adults	M M E E M	<40 m, demersal <40 m, planktonic marsh edge, SAV, marsh ponds, inner marsh, oyster reefs same as above <33 m, silt, soft mud
Pink shrimp EFH: Fla.	eggs larvae postlarvae/juvenile subadults adults	M M E E M	<65 m, demersal <65 m, planktonic SAV, sand/shell substrate SAV, sand/shell substrate <65 m, sand/shell substrate
Royal red shrimp EFH: NE Gulf of Mex.	adults	M	250 – 500m, terrigenous silt and silty sand & calcareous mud
Red drum EFH: Fla. to Tex.	eggs larvae postlarvae/juvenile subadults adults	M M M/E E M/E	planktonic planktonic SAV, estuarine mud bottoms, marsh/water interface mud bottoms, oyster reefs Gulf of Mexico & estuarine mud bottoms, oyster reef
Red grouper EFH: Eastern Gulf of Mex. (W. Fla. Shelf)	eggs juvenile adults	M M M	planktonic, 25 – 50 m hard bottoms, SAV, reefs reefs, ledges, outcrops
Black grouper EFH: E. Gulf of Mex.	juvenile adults	M/E M	FL estuaries & Gulf of Mexico rocky coral reefs to 150 m
Gag grouper EFH: E. Gulf of Mex.	eggs juvenile adults	M M/E M	planktonic SAV & oyster beds in coastal lagoons and estuaries hard bottoms, reefs, coral; 10 – 100 m
Scamp EFH: E Gulf of Mex.	juvenile adults	M M	hard bottoms, reefs; 12 – 33 m hard bottoms; 12 – 189 m
Red snapper EFH: Fla. to Tex.	larvae postlarvae/juvenile adults	M M M	structure, sand/mud; 17-183 m structure, sand/mud; 17-1183 m reefs, rock outcrops, gravel; 7 – 146 m
Vermilion snapper EFH: Fla. to Tex.	juvenile	M	reefs, hard bottom, 20 – 200 m
Gray snapper EFH: E Gulf of Mex.	larvae postlarvae/juvenile adults	M E M/E	planktonic SAV, mangrove, mud SAV, mangrove, sand, mud

Yellowtail snapper EFH: E Gulf of Mex.	juvenile adults	M/E M	SAV, mangrove, sand, mud reefs
Lane snapper EFH: Fla. and Tex.	juvenile adults	M/E M	SAV, mangrove, sand, mud reefs, sand, 40 132 m
Greater amberjack EFH: Fla. to Tex.	juvenile adults	M M	floating plants (Sargassum), debris pelagic over reefs/wrecks
Lesser amberjack EFH: Fla. to Tex.	juvenile adults	M M	floating plants (Sargassum), debris oil rigs, irregular bottom features
Tilefish EFH: Fla. to Tex.	juvenile adults	M M	burrows rough bottom, 250 – 350 m
Gray triggerfish EFH: Fla. & La./Tex. Shelves	eggs larvae postlarvae/juvenile adults	M M M M	sand floating plants (Sargassum), debris floating plants (Sargassum), debris, mangrove reefs, >10 m
King mackerel EFH: Fla. & La./Tex. Shelves	juvenile adults	M M	pelagic pelagic
Spanish mackerel EFH: Fla. to Tex.	larvae juvenile adults	M M/E M	<50 m isobath offshore, beach, estuarine pelagic
Cobia EFH: Fla. to Tex.	eggs larvae postlarvae/juvenile adults	M M/E M M	pelagic estuarine & shelf estuarine & shelf estuarine & shelf
Dolphin EFH: Fla. to Tex.	larvae postlarvae/juvenile adults	M M M	epipelagic epipelagic epipelagic
Bluefish EFH: Fla. to Tex.	postlarvae/juvenile adults	M/E M/E	beaches, estuaries, inlets gulf and estuaries, pelagic
Little tunny EFH: Fla. to Tex.	postlarvae/juvenile adults	M M	coastal & shelf, pelagic coastal & shelf, pelagic
Stone crab EFH: Fla. estuaries & nearshore waters	larvae juvenile adults	M/E M/E M/E	planktonic, moderate-high salinity shell, SAV shell, FAV, coal
Spiny lobster EFH: E Gulf of Mex.	larvae juvenile adults	M M M	algae, SAV sponge, coral hard bottoms, crevices
Coral	All stages	M	Flower Gardens, Fla. Middle Grounds

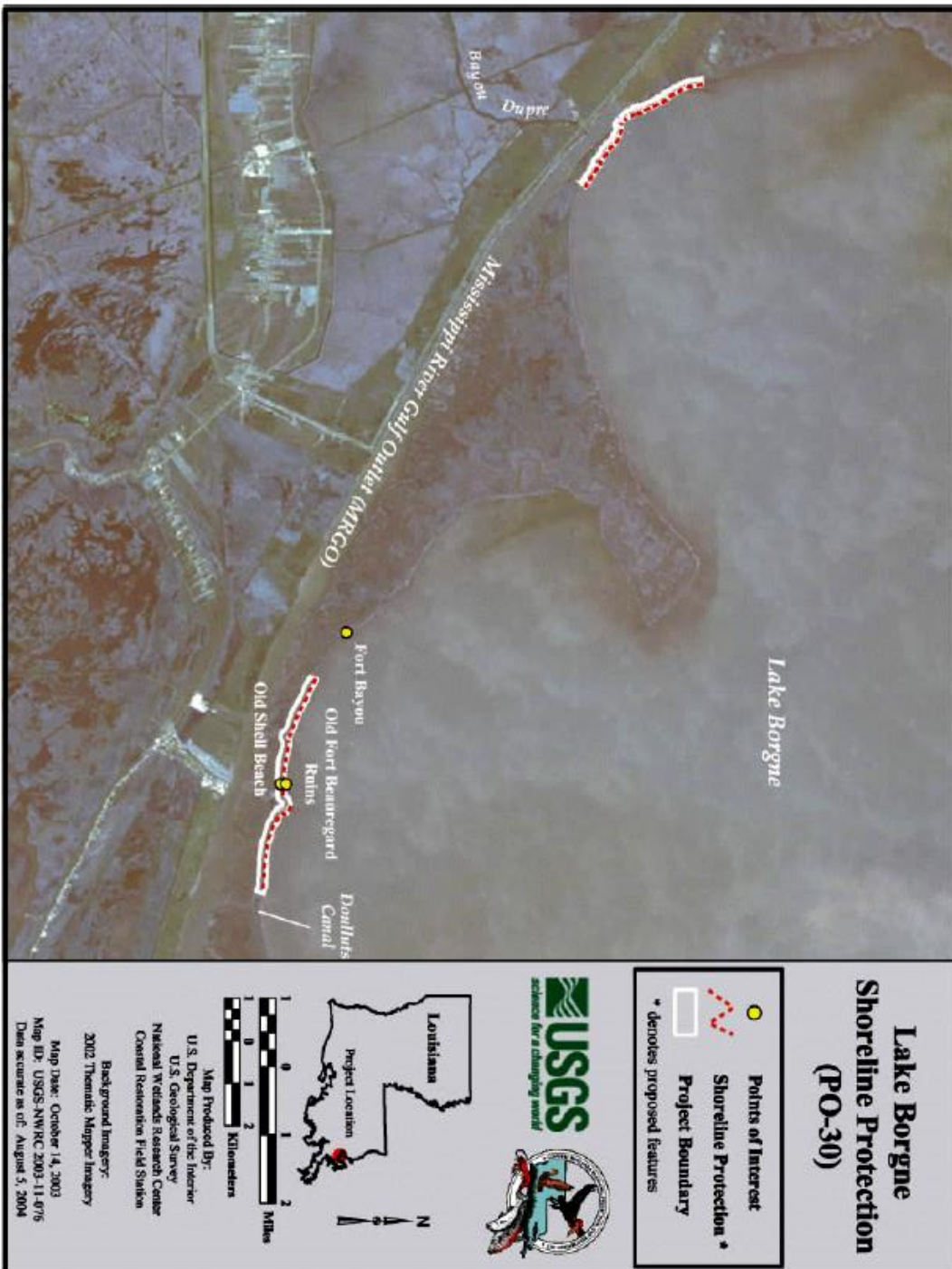


Figure 1 - Project Location Map

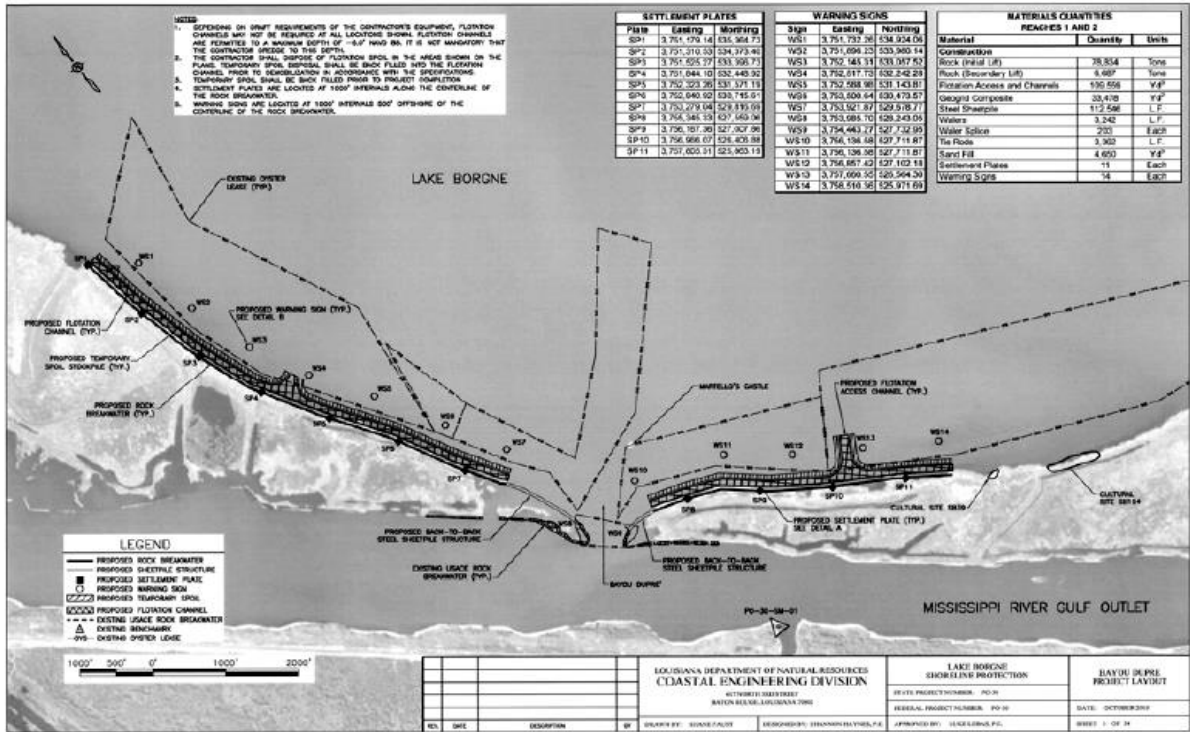


Figure 2 - Bayou Dupre' Project Layout and Breakwater Alignment

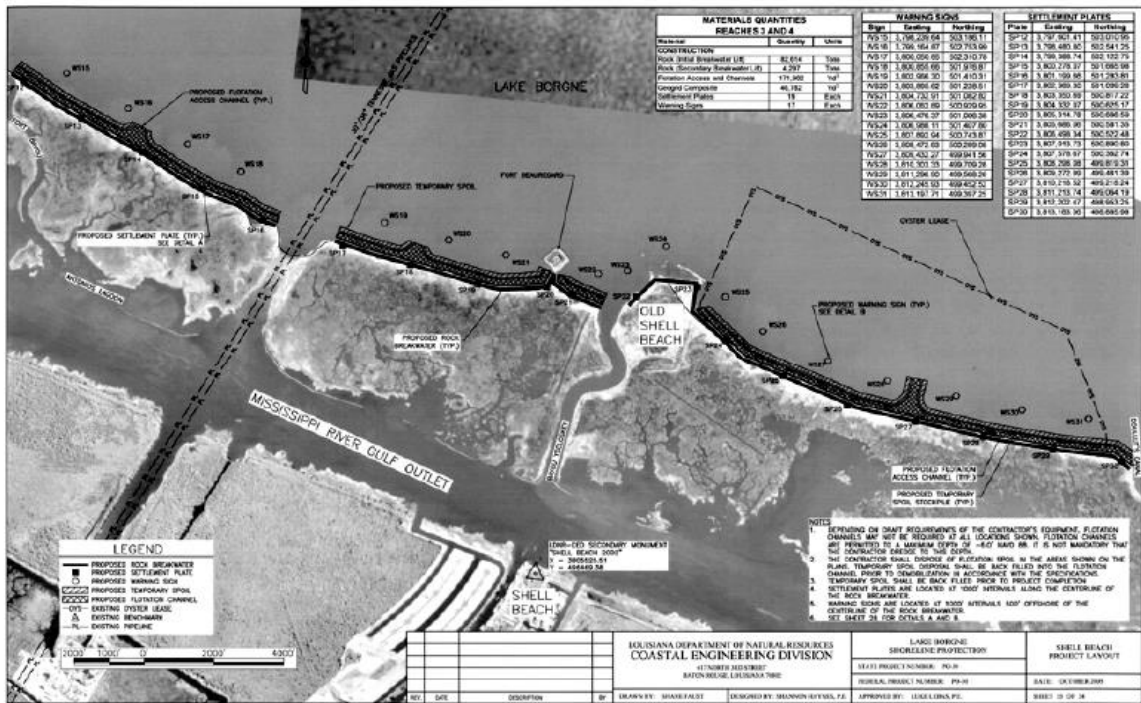


Figure 3 - Shell Beach Project Layout and Breakwater Alignment

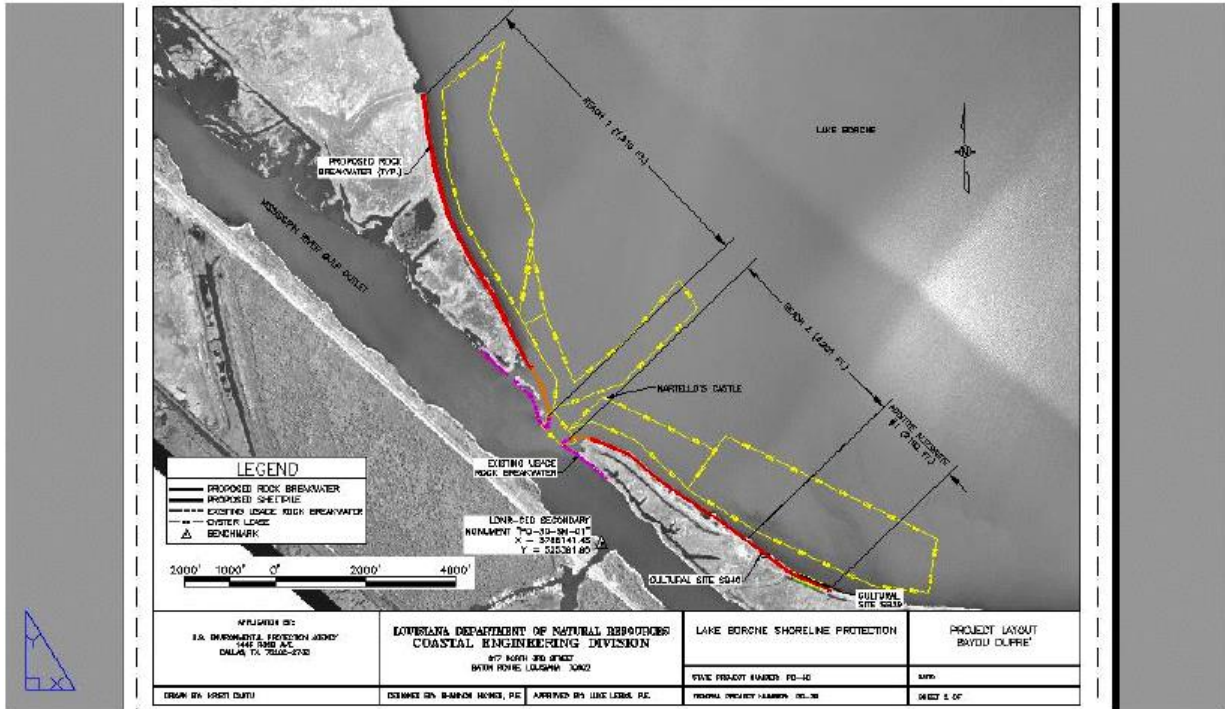


Figure 4 - Bayou Dupre' Additive Alternate #1 (removed from final design)





### SHELL BEACH

- LEGEND
- Formerly Used Defense Site
  - ▨ Airports
  - Cities/Towns
  - ⚡ Interstates
  - ⚡ U.S. Highways
  - Streets/Roads
  - Rivers/Streams
  - Lakes/Ponds
  - Urban Areas



Figure 5 - Shell Beach Formerly Used Defense Site

List of Comment Letters, Memorandum and E-mails

Letters of May 15, 2001, State of Louisiana, Louisiana Department of Transportation and Development, Floodplain Insurance Manager

Letters of May 31, 2002, State of Louisiana, Louisiana Department of Transportation and Development, Floodplain Insurance Manager

Letter of May 22, 2001, U.S. Natural Resources Conservation Service

Letter of July 3, 2002, U.S. Natural Resources Conservation Service

Letter of September 27, 2002, U.S. Natural Resources Conservation Service

Letter of May 24, 2001, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service

Letter of June 12, 2002, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service

Letter of May 30, 2001, State of Louisiana Department of Natural Resources

Letter of July 23, 2002, State of Louisiana Department of Natural Resources

Letters of June 5, 2001, U.S. Fish and Wildlife Service

Letters of May 30, 2002, U.S. Fish and Wildlife Service

Letter of June 25, 2001, Louisiana Office of Cultural Development, State Historic Preservation Officer

Letter of June 19, 2002, Louisiana Office of Cultural Development, State Historic Preservation Officer

Letter of August 20, 2004, Louisiana Office of Cultural Development, State Historic Preservation Officer

Letter of June 19, 2003, Department of the Army, New Orleans District, Corps of Engineers

E-Mail of August 16, 2005, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service

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Impacts of Lake Borgne Shoreline Protection Project (PO-30)

On the

Endangered West Indian Manatee (*Trichechus manatus*)



Date: March 2007



This Biological Assessment is submitted to the  
U.S. Fish and Wildlife Service by the  
U.S. Environmental Protection Agency, Region 6,  
to fulfill requirements of Section 7 of the  
Endangered Species Act Amendment of 1978.

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## Biological Assessment

Impacts of Lake Borgne Shoreline Protection Project (PO-30)

on the

Endangered West Indian Manatee (*Trichechus manatus*)

### 1.0 Introduction

The Lake Borgne Shoreline Protection Project (herein referred to as PO-30) is located in the Pontchartrain Basin on the southern shoreline of Lake Borgne. The purpose of the project is to halt the retreat of the Lake Borgne shoreline and maintain the integrity of the narrow marsh rim between the Mississippi River Gulf Outlet (MRGO) and Lake Borgne. The Louisiana Coastal Wetlands Conservation and Restoration Task Force (Task Force) designated PO-30 as part of the 10<sup>th</sup> Priority Project List (PPL) the United States Environmental Protection Agency Region 6 (EPA) as the lead federal sponsor. The Louisiana Department of Natural Resources, Coastal Engineering Division (LDNR-CED) was selected by EPA to perform engineering and design for the project. Approval to proceed with engineering and design was granted at the January 2001 Task Force meeting. Funds for the project are provided through the Federal Coastal Wetlands Planning, Protection and Restoration Act (Public Law 101-646) (CWPPRA). Local cost share is provided by the State of Louisiana's Wetlands Conservation Trust Fund. The initial project provided lakeside protection only to the Old Shell Beach area. In April 2002, the Task Force combined the original project and funding with the Lake Borgne Shoreline Protection at Bayou Dupre' (PO-31) from PPL 11. The combined project (PO-30) is divided into two authorized sections, Bayou Dupre' and Shell Beach. The Shell Beach section extends approximately 3.2 miles between Fort Bayou and Doulluts Canal. The Bayou Dupre' section extends approximately 1.4 miles to the west and 0.9 miles to the east of Bayou Dupre' (Figure 1). The Task Force approved funds for construction in February 2006. LDNR is processing paperwork to advertise for construction bids with construction anticipated to begin late Spring or early Summer 2007.





Figure 1 – PO-30 project boundaries

Based on a comprehensive literature review, environmental report, site-specific data, project engineering and intra-agency discussions, EPA has determined that there are no significant adverse environmental impacts anticipated from the implementation of the preferred design alternative (EPA 2005). We have identified the West Indian manatee, *Trichechus manatus*, as a federally listed endangered species that may occur within the project vicinity. This Biological Assessment (BA) addresses the impacts on and benefits to the endangered West Indian manatee and designated critical habitat that may be affected by the proposed project (PO-30). It is submitted to the U.S. Fish and Wildlife Service (USFWS) by EPA to fulfill requirements of Section 7 of the Endangered Species Act Amendment of 1978. This assessment is based on conversations and correspondence with knowledgeable persons; a review of published literature; the results of on-site inspections; an analysis of the likely effects of the action on the West Indian manatee and its designated critical habitat (if applicable to the PO-30 project area); and a determination of whether the PO-30 project is “likely (or not likely) to adversely affect” this species or its designated critical habitat (if any exists with the PO-30 project area).

## 2.0 Project Design

According to the USGS, the narrow strip of marsh which separates Lake Borgne from the MRGO is degrading at an estimated 7-9 feet per year at Shell Beach, and 6-7 feet per year at Bayou Dupre'. This narrow strip protects the coastal communities of Shell Beach, Yscloskey, and Hopedale from wave energy and tidal surge generated in Lake Borgne. The selected design alternative utilizes a combination of rock breakwaters and back-to-back steel sheet pile structures to halt shoreline retreat and direct marsh loss along Lake Borgne, and prevent further coalescence of the lake and MRGO. A continuous rock breakwater will be constructed along the designated shoreline section of Lake Borgne at Bayou Dupre' and Shell Beach. A steel sheet pile structure will tie the breakwater into the existing offshore U.S. Army Corps of Engineers (USACE) rock breakwater along the MRGO. At Shell Beach, the rock breakwater will tie into the existing rock breakwater that surrounds the perimeter of Fort Beauregard. The only opening in the breakwater will occur along the mouth of Bayou Yscloskey and across the Tennessee Gas Pipeline right-of-way. A temporary flotation channel will be excavated along the shoreline to facilitate construction and maintenance of the rock breakwater as shown in Figure 2.

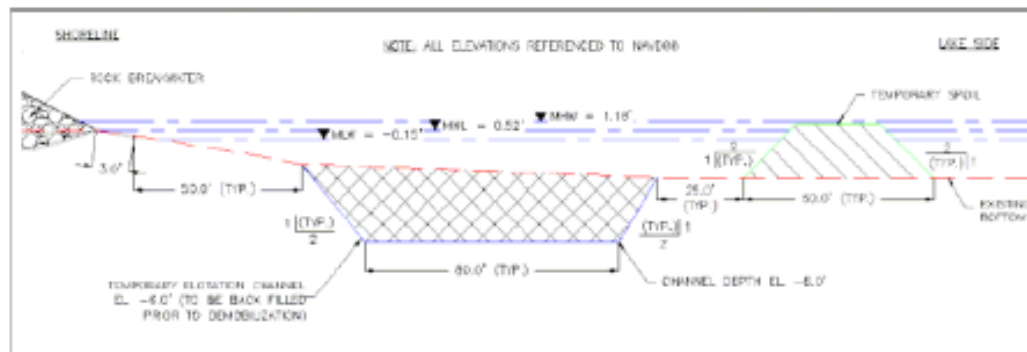


Figure 2 - Typical Section of Rock Breakwater with Flotation Channel (NTS).

End-on-construction will be used to place rock in the vicinity of the former naval base at Shell Beach in order to avoid the debris in the area. Flotation access is not required for the end-on-construction portion since all activities will be within the footprint of the breakwater. A typical end-on-construction section is shown in Figure 3.

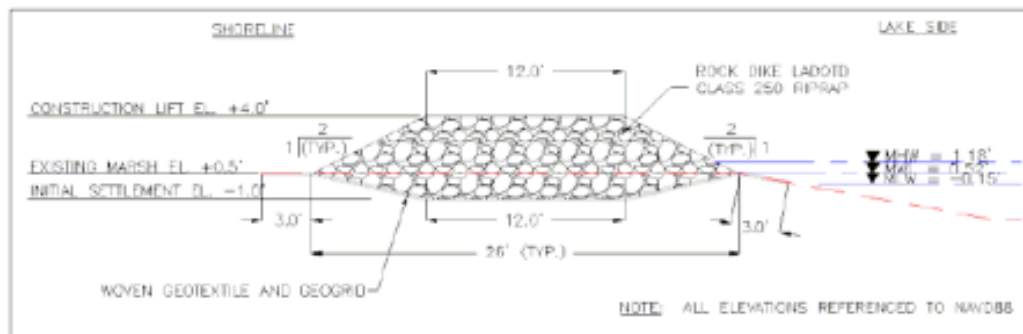


Figure 3 - Typical Section of Rock Breakwater Using End-On-Construction

Per CWPPRA program specifications, the PO-30 design life is 20 years. Additional project details are included in Appendix A.

**A bucket dredge will be utilized to excavate sediments and construct the flotation canal.** Approximately 281,461 cubic yards of material will be deposited on the lakeside of the flotation channel and graded down into the flotation channel after construction and/or maintenance of the rock breakwater are completed. Bucket dredging utilizes various types and sizes of buckets depending on the operational requirements of the project. The types of buckets typically used include clamshell, orangepeel, and dragline (USACE 1983). Bucket sizes typically range from 1 to 12 cubic yards. The dredge used to create the flotation channel for the Barataria Basin Landbridge Shoreline Protection, BA-27d CU #6 CWPPRA project, is shown in Figure 4. It is anticipated that the PO-30 contractor will use similar equipment to dredge the flotation canal. Once the dredge is positioned at the location where work is to start, anchors and spuds are lowered into place and the bucket is dropped in the open position through the water, penetrating into the bottom material. The sides or jaws of the bucket are then closed and the material is removed from the bottom and contained within the bucket compartment. The bucket is then raised above the water surface and swung to a point for material release. One advantage to the bucket dredge is that the volume of excess water is minimal, which increases the efficiency of moving material from the dredging area to the placement area (USACE 1983).



Figure 4 – Dredge utilized in the Barataria Basin Landbridge Shoreline Protection CWPPRA project (BA-27d, CU#6).

The primary potential impact to the West Indian manatees from PO-30 would include possible collisions with service vessels during construction and maintenance events. Controls have been outlined to minimize collisions. All contract personnel will be informed of the potential presence of manatees and the need to avoid collisions with manatees. All construction personnel are responsible for observing water-related activities for the presence of manatee(s). Temporary signs will be posted prior to and during all construction/dredging activities to remind personnel to be observant for manatees within vessel movement zones. At least one sign, measuring at least 3 feet by 4 feet which reads "Caution: Manatee Area" will be placed where it is visible to vessel operators. Another sign measuring at least 8 1/2" by 11" explaining the requirements for "Idle Speed/No Wake" and the shut down of in-water operations will be posted in a location prominently visible to all personnel engaged in water-related activities. All signs are to be removed upon completion of the project. Siltation barriers, if used, will be made of material that will not entangle manatees, and will be properly secured and monitored. If a manatee is sighted within 100 yards of the active work zone, special operating conditions will be implemented, including: no operation of moving equipment within 50 feet of a manatee; all vessels will operate at no wake/idle speeds within 100 yards of the work area; and siltation barriers, if used, will be re-secured and monitored. Special operating conditions are no longer necessary once the manatee has left the 100-yard buffer zone around the work area on its own accord, but careful observations would be resumed. Any manatee sighting will be immediately reported to the USFWS (337-291-3100) and the Louisiana Department of Wildlife and Fisheries (LDWF), Natural Heritage Program (225-765-2821).

### 3.0 West Indian Manatee (*Trichechus manatus*)

#### 3.1 Federal Status

The West Indian manatee was originally listed as an endangered species in 1967 (32 FR 4061), under the Endangered Species Preservation Act of 1966 80 Stat. 926; 16 U.S.C. 668aa(c). The manatee was listed again in December, 1970 by amending Appendix A of 50 CFR 17 to include additional names to the list of foreign endangered species (35 FR 18319). West Indian manatees in the United States are also protected under federal law by the Marine Mammal Protection Act of 1972. Additionally, the Florida Manatee Sanctuary Act of 1978 states, "It is unlawful for any person, at any time, intentionally or negligently, to annoy, molest, harass, or disturb any manatee." The Act also established speed zones and restricted access to winter aggregation sites.

#### 3.2 Description

The West Indian manatee (*T. manatus*) is a large, herbivorous, aquatic mammal with an average adult length and weight of 3 meters and 1,000 kilograms, respectively. Manatees, like other large mammals, are older at maturity, have a relatively low rate of reproduction, and a potentially long life span in the wild (up to 60 years). Their life history strategy requires high adult survival rates and they are highly susceptible to human impacts that increase mortality rates (Runge et al. 2004). Females are generally larger than males and

are most often distinguished by the presence of mammary glands. Manatees vary in color from gray to brown, have no hindlimbs and their forelimbs are modified flippers similar to those of seals (FWS 1993). They are generally considered slow moving but they can reach speeds up to 25 kilometers per hour and travel up to 50 kilometers per day (O'Shea 1994, Sleeper 1984).

Manatee muzzles are comprised of muscular, flexible upper and lower lip pads covered in stiff whiskers and are used with their forelimbs to manipulate food. They feed mainly on seagrasses and other submersed vegetation and their mouths are oriented downward for greater efficiency in grasping these plants. Manatees have seven to eight molars (cheek teeth) in each quadrant of their mouth at any given time. The molars regenerate and erupt from the rear of the tooth row as worn teeth are shed at the front of the mouth. The entire row moves forward and bone between the teeth is absorbed as the teeth migrate to their new position and are anchored in with redeposited bone. This limitless supply of molars is a special adaptation unique to manatees and is found in no other mammal (Domning and Hayek 1984, Zeiller 1992, Sleeper 1984). Manatees have small, beady black eyes and their nostrils are at the top of their snout, large and valve-like, remaining closed while submerged. Ears are present but minute, and their inner ear structure suggests that they are most adept to sound with a narrow, low frequency.

### ***3.3 Habitat***

Manatees tolerate a wide salinity range and thus live in a variety of habitats including canals, rivers, estuaries, saltwater bays and even marine coastlines. However, they do require access to a freshwater drinking source even when residing in estuarine and marine environments. They seem to prefer water depths from 3-7ft and avoid extremely shallow waters because of their large size. Still, they are rarely found at depths greater than 20 feet. Their range is most restricted by temperature and 20°C is likely the minimum suitable water temperature due to their extremely low metabolism and high thermal conductance (Irvine, 1983). Manatees wintering in colder waters are highly susceptible to cold-related mortality and many animals seek warm water refuge in the winter. Warm water outfalls from industrial facilities and warm-water springs often support large aggregations of manatees (Laist and Reynolds 2005).

#### ***Critical Habitat***

Critical habitat is defined by the Endangered Species Act of 1973 as a specific geographic area that is essential for the conservation of a threatened or endangered species. Critical habitat for the Florida manatee was designated in 1976 (50CFR 17.95(a)). The critical habitat was confined to Florida sites and there was no mention of additional critical habitat in Louisiana. In addition, the proposed project location along the Lake Borgne shoreline supports minimal, if any, aquatic vegetation that would support manatee foraging.

### ***3.4 Distribution***

The West Indian manatee has two subspecies that may be present in the United States. The Florida subspecies (*Trichechus manatus latirostris*) is generally restricted to peninsular Florida throughout the year but does disperse in the coasts of neighboring states (Georgia,

South Carolina, North Carolina, Virginia, Alabama, Louisiana, and Texas) during the warmer months (March – November).

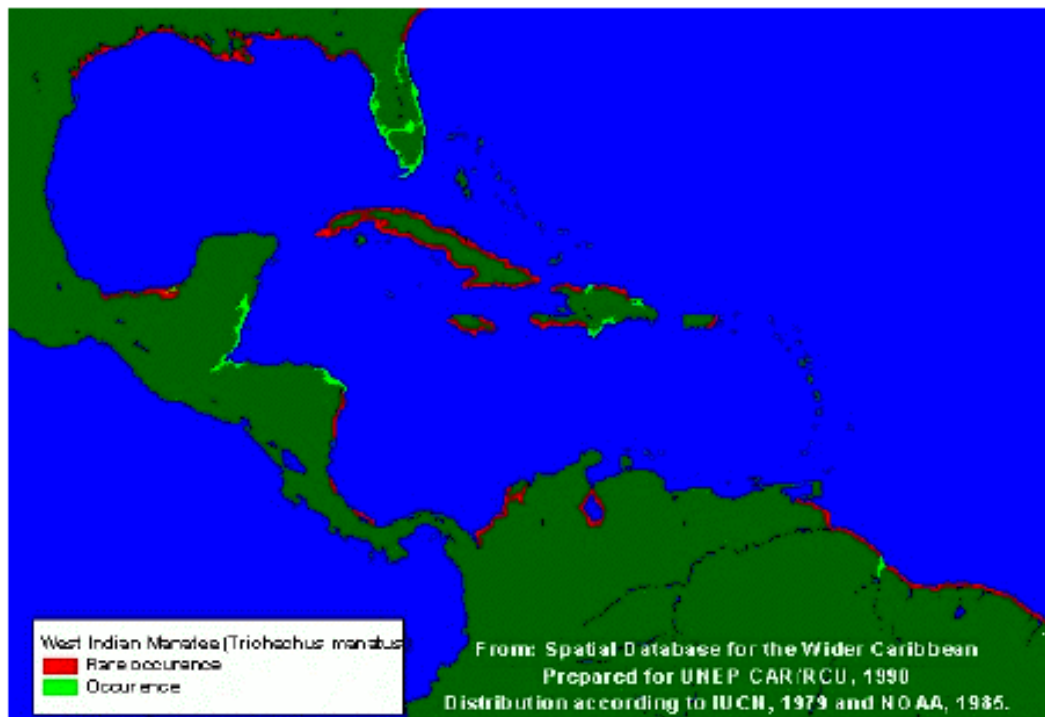


Figure 5 – *Trichechus manatus* general distribution.

During the winter season (December to January) Florida manatees confine their range to the warmer waters of south Florida and warm-water sites associated with power plant thermal outfalls and artesian springs (FWS 1993). Interestingly, Rathbun et al. (1990) noted that roughly 92% of females and 84% of males in their study of 100 individuals returned to their winter refuges each year. Several manatees on the East coast of Florida display seasonal migration patterns with rapid movements south in early winter and north in spring, with travel over 820 km in some cases (Reid et al. 1991). The Antillean manatee (*Trichechus manatus manatus*) is found in South America and Mexico but may migrate as far north as Texas so the subspecies of Texas manatees is sometimes unclear (FWC 2006). Manatees sighted on the Louisiana coast are likely of the Florida subspecies.

West Indian manatees occasionally enter Lakes Pontchartrain and Maurepas, and associated coastal waters and streams during the summer months (i.e., June through September). There have been over 350 reports of manatees in the Gulf of Mexico west of Florida since the early 1900s (Fertl et al. 2005). Fifty-eight were sighted in Louisiana from 1995 to 2001 and manatees have been reported in the Lake Pontchartrain area since 1943, with the number of occurrences increasing since the mid-1990's (Wilson, 2003). Unfortunately, there is currently very limited data on the specific number of manatees, habitats used or their foraging habits in the Lake (Abadie et al. 2000).

### *3.5 Breeding and Reproduction*

For female manatees, sexual maturation occurs between 3 and 5 years of age (FWS 1993, Lefebvre and O'Shea 1995, Marmontel 1995). Size and season play the largest roles in male spermatogenesis. There is no fixed breeding season but neither mating nor birthing generally occurs in winter due to low temperatures. Up to 20 males will pursue a female in estrus and she will mate with several bulls during this period (Marmontel 1995, O'Shea 1994, Sleeper 1984). The gestation period for female manatees is between 11 and 13 months (Lefebvre and O'Shea 1995, Sleeper 1984). They generally give birth to one calf, with a sex ratio of 1:1 at birth. Twins are not completely uncommon and all calves are born tail first with an ability to swim on their own. There is a single breast positioned at the posterior margin of the juncture of each forelimb, for female manatees. The position of the breasts allows the young to grasp the nipple and parallel the mother with hydrodynamic configuration while swimming (Zeiller 1992). Calves can weigh 28-36 kilograms with a length up to 2 meters at birth and can eat vegetation within a few weeks, although they nurse as long as they are with the mother. The time a calf remains with the female is variable but averages 1.5 to 2 years (Reid et al. 1995, Koelsch 2001). A female gives birth every 2 to 5 years and can have 12-14 calves in her lifetime (Marmontel 1995, Koelsch 2001).

### *3.6 Reasons for Decline*

#### *3.6.1 Habitat Loss*

The increasing number of humans along the coasts has led to the destruction of many native habitats. It is estimated that 1000 people move to Florida each day and many settle along the coast. Wetlands, which support manatees and hundreds of other species, are drained to construct housing (O'Shea 1994). Natural and chemical fertilizers, pesticides, and herbicides often contaminate the water resources that remain (Zeiller 1992). This has a dramatic affect on manatees because they are vegetarian and require up to 15% of their body weight in food per day.

#### *3.6.2 Boat Collisions*

Manatees' only natural defense is avoidance and collisions with watercraft are a serious threat to the species. Boats collisions are so common that the resulting propeller scars are actually used to identify animals. Ackerman et al. (1995) showed that watercraft collision accounted for 83% of the human-related deaths and that the number of manatees killed by watercraft in Florida each year correlated to the number of commercial and pleasure boats registered. Manatee scarring is so prevalent that scar patterns are used to identify individuals in distribution studies (Rathbun et al. 1990). Speed zones have been created to reduce fatalities but some research suggests that this exacerbates the problem because manatees cannot hear the sound frequency generated. A study by Gerstein (2002) reported that manatee's peak sensitivity hearing range is between 16,000 and 18,000 hertz. Sensitivity decreases about 10 decibel per octave below 16,000 hertz, and 20 decibels per octave below 2,000 hertz. This creates a problem because most boats produce sounds below 1,000 hertz, on the fringe of the manatees hearing range. The study also found that manatees were unable to detect idling boats under ambient noise

conditions recorded in the field. Mikinsis (2006) also noted that sounds encountered by manatees in their natural environment (e.g. from ambient noise, watercraft, snapping shrimp, and marine mammal vocalizations) often mask one-another and reduce the probability of detecting signals of interest. This suggests that there would have been an increase in collisions with recent speed zones but there has been an overall decrease in mortalities and further research is needed to reach a conclusion. When manatees do detect approaching vessels, they generally respond by increasing their swimming speed and retreating to deeper water (Nowacek et al. 2004).



Figure 6 – Propeller scars on an adult manatee.

### 3.6.3 Other Human-Related Threats

Entanglement, floodgates, and canal locks do not kill as many manatees as watercraft collisions but they still pose a significant problem to manatees. Fishing line can easily become wrapped around their flippers and cut off circulation. Discarded fishing hooks can also become embedded in the animal's lips as they feed along the bottom in seagrass beds (Sleeper 1984). Overall, human activities have caused the death of about 1/3 of manatees recovered since the mid-1970s (Geraci and Lounsbury 1993).

### 3.6.4 Nonhuman Threats

Hurricanes and other tropical storms can cause manatees to strand and decimate seagrass beds. An analysis of 19 years of photo-identification data for a subpopulation of manatees in northwest Florida with low human impact revealed a significant variation in annual survival rates. The study found that survival probability dropped in years with intense hurricanes (Category 3 or greater) and a major winter storm (Langtimm and Beck, 2003). Red-tides can cause mass stranding and death of manatees when ingested or overly exposed. Red-tide brevetoxin (*Gymnodinium breve*) presumably caused 37 deaths near the Ft. Meyers

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aggregation site in 1982. Southwest Florida saw record numbers of manatee deaths in 1996 with 304 total deaths and 158 of those linked to a red-tide outbreak. This occurrence was rare and linked to unusually high salinities in the estuary that allowed red-tide organisms and ascidians to flourish (Ackerman et al. 1995, FWS 1996a, FWS 1996b).

#### **4.0 Impact Analysis of PO-30 on West Indian Manatee**

Any effects to the West Indian Manatee from PO-30 are confined to possible collision with service vessels during the construction and maintenance activities. **LDNR and all contractors will be informed to abide by the procedures outlined in Section 2.0, and in this section, to avoid or minimize any impacts to the manatees.**

A "Take" of a listed species is defined in the Endangered Species Act and implementing regulations as the act or attempted act of pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, harming, or harassing. Harm and harass are defined as the act of disturbing individuals or modifying habitat to the extent that wildlife are actually killed or injured by impairment of essential behavioral patterns such as breeding, feeding or sheltering.

Controls will be implemented to ensure that the project activities are conducted first to avoid, and otherwise to minimize, the potential effects on manatees. Specifically, we propose to use the following precautions from May to October, when manatees have the greatest potential for entering the project area:

- All personnel associated with the project shall be instructed about the presence of manatees and the need to avoid collisions with and injury to manatees. All construction personnel will be advised that there are civil and criminal penalties for harming, harassing, or killing manatees, which are protected under the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973.
- All vessels associated with the construction project shall operate at "Idle Speed/No Wake" at all times while in the immediate area and while in water where the draft of the vessel provides less than a four-foot clearance from the bottom. A sign measuring at least 8 1/2" by 11" explaining the requirements for "Idle Speed/No Wake" and the shut down of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities. All vessels will follow routes of deep water whenever possible.
- Siltation or turbidity barriers, if used, shall be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers will not impede manatee movement.

- All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). If a manatee is sighted within 100 yards of the active work zone, special operating conditions shall be implemented, including:
  - No operation of moving equipment within 50 feet of a manatee;
  - All vessels shall operate at no wake/idle speeds within 100 yards of the work area; and
  - Siltation barriers, if used, shall be re-secured and monitored.

Once the manatee has left the 100-yard buffer zone around the work area on its own accord, special operating conditions are no longer necessary, but careful observations will be resumed.

- Any sighting of, collision with, or injury to a manatee shall be immediately reported to the USFWS (337-291-3100) and the LDWF, Natural Heritage Program (225-765-2821).
- Temporary signs shall be posted prior to and during all construction/dredging activities to remind personnel to be observant for manatees during active construction/dredging operations or within vessel movement zones (i.e., work area), and at least one sign shall be placed where it is visible to the vessel operator. Awareness signs that have been approved for these uses in Florida have had the following specifications: One sign measuring at least 3 feet by 4 feet which reads "Caution: Manatee Area" will be posted. As previously mentioned, a sign measuring at least 8 1/2" by 11" explaining the requirements for "Idle Speed/No Wake" and the shut down of in-water operations will be posted in a location prominently visible to all personnel engaged in water-related activities. All signs are to be removed upon completion of the project.

Given the rare occurrence of manatees and lack of critical habitat within the project area, along with implementation of the above operational precautions, no collision fatalities are expected. The potential for a Take as a result of constructing and/or implementing the PO-30 project is highly unlikely, and any potential adverse effects to manatees will be avoided or minimized. Therefore PO-30 is not likely to adversely affect the West Indian manatee.

## 5.0 Recommendations and Conclusions

It is possible that West Indian manatees may be present in the PO-30 project area during the construction and maintenance events. Critical habitat is not designated in the PO-30 area and the Lake Borgne shoreline supports minimal, if any, aquatic vegetation that would support manatee foraging. Nevertheless, contractors will be made aware of the possibility for manatee presence and they will be required to implement preventive measures as discussed in Sections 2 and 4.

Based upon the findings of this biological assessment, the PO-30 project has been determined to "not likely adversely affect" the West Indian manatee.

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# Biological Assessment

Impacts of Lake Borgne Shoreline Protection Project (PO-30)

on the

Threatened Gulf Sturgeon (*Acipensei oxyrinchus desotoi*)



March 2007

This Biological Assessment is submitted to the  
U.S. Fish and Wildlife Service by the  
U.S. Environmental Protection Agency, Region 6,  
to fulfill requirements of Section 7 of the  
Endangered Species Act Amendment of 1978.

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## Biological Assessment

### Impacts of Lake Borgne Shoreline Protection Project (PO-30)

on the

### Threatened Gulf Sturgeon (*Acipensei oxyrinchus desotoi*)

#### 1.0 Introduction

The Lake Borgne Shoreline Protection Project (herein referred to as PO-30) is located in the Pontchartrain Basin on the southern shoreline of Lake Borgne. The purpose of the project is to halt the retreat of the Lake Borgne shoreline and maintain the integrity of the narrow marsh rim between the Mississippi River Gulf Outlet (MRGO) and Lake Borgne. The Louisiana Coastal Wetlands Conservation and Restoration Task Force (Task Force) designated PO-30 as part of the 10<sup>th</sup> Priority Project List (PPL) the United States Environmental Protection Agency Region 6 (EPA) as the lead federal sponsor. The Louisiana Department of Natural Resources, Coastal Engineering Division (LDNR-CED) was selected by EPA to perform engineering and design for the project. Approval to proceed with engineering and design was granted at the January 2001 Task Force meeting. Funds for the project are provided through the Federal Coastal Wetlands Planning, Protection and Restoration Act (Public Law 101-646) (CWPPRA). Local cost share is provided by the State of Louisiana's Wetlands Conservation Trust Fund. The initial project provided lakeside protection only to the Old Shell Beach area. In April 2002, the Task Force combined the original project and funding with the Lake Borgne Shoreline Protection at Bayou Dupre' (PO-31) from PPL 11. The combined project (PO-30) is divided into two authorized sections, Bayou Dupre' and Shell Beach. The Shell Beach section extends approximately 3.2 miles between Fort Bayou and Doulluts Canal. The Bayou Dupre' section extends approximately 1.4 miles to the west and 0.9 miles to the east of Bayou Dupre' (Figure 1). The Task Force approved funds for construction in February 2006. LDNR is processing paperwork to advertise for construction bids with construction anticipated to begin late Spring or early Summer 2007.



Figure 1 – PO-30 project boundaries

Based on a comprehensive literature review, environmental report, site-specific data, project engineering and intra-agency discussions, EPA has determined that there are no significant adverse environmental impacts anticipated from the implementation of the preferred design alternative (EPA 2005). We have identified the Gulf sturgeon, *Acipenser oxyrinchus desotoi*, as a federally listed threatened species that may occur within the project vicinity. This Biological Assessment (BA) addresses the impacts on and benefits to the threatened Gulf sturgeon and its designated critical habitat that may be affected by the proposed project (PO-30). It is submitted to the US Fish and Wildlife Service (USFWS) by EPA to fulfill requirements of Section 7 of the Endangered Species Act Amendment of 1978. This assessment is based on conversations and correspondence with knowledgeable persons, a review of published literature, the results of on-site inspections, an analysis of the likely effects of the action on the Gulf sturgeon and its designated critical habitat found in the area, and a determination of whether the proposed project is “likely (or not likely) to adversely affect” this species, or its designated critical habitat.

## 2.0 Project Design

According to the USGS, the narrow strip of marsh which separates Lake Borgne from the MRGO is degrading at an estimated 7-9 feet per year at Shell Beach, and 6-7 feet per year at Bayou Dupre'. This narrow strip protects the coastal communities of Shell Beach, Yscloskey, and Hopedale from wave energy and tidal surge generated in Lake Borgne. The selected design alternative utilizes a combination of rock breakwaters and back-to-back steel sheet pile structures to halt shoreline retreat and direct marsh loss along Lake Borgne, and prevent further coalescence of the lake and MRGO. A continuous rock breakwater will be constructed along the designated shoreline section of Lake Borgne at Bayou Dupre' and Shell Beach. A steel sheet pile structure will tie the breakwater into the existing offshore U.S. Army Corps of Engineers (USACE) rock breakwater along the MRGO. At Shell Beach, the rock breakwater will tie into the existing rock breakwater that surrounds the perimeter of Fort Beauregard. The only opening in the breakwater will occur along the mouth of Bayou Yscloskey and across the Tennessee Gas Pipeline right-of-way. A temporary flotation channel will be excavated along the shoreline to facilitate construction and maintenance of the rock breakwater as shown in Figure 2.

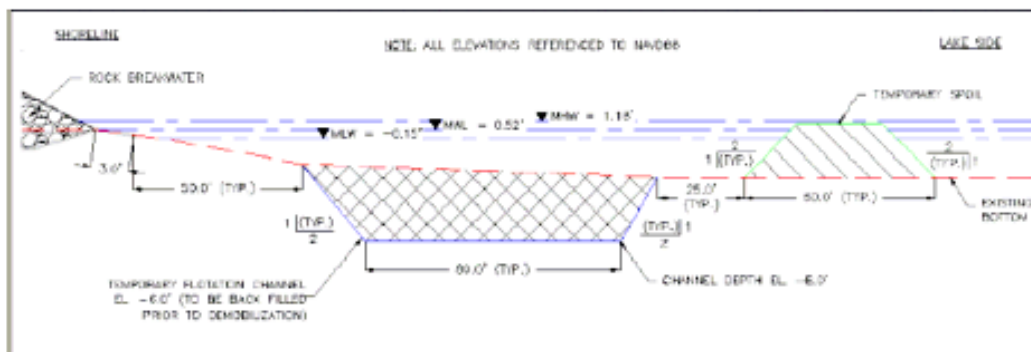


Figure 2 - Typical Section of Rock Breakwater with Flotation Channel (NTS).

End-on-construction will be used to place rock in the vicinity of the former naval base at Shell Beach in order to avoid the debris in the area. Flotation access is not required for the end-on-construction portion since all activities will be within the footprint of the breakwater. A typical end-on-construction section is shown in Figure 3.

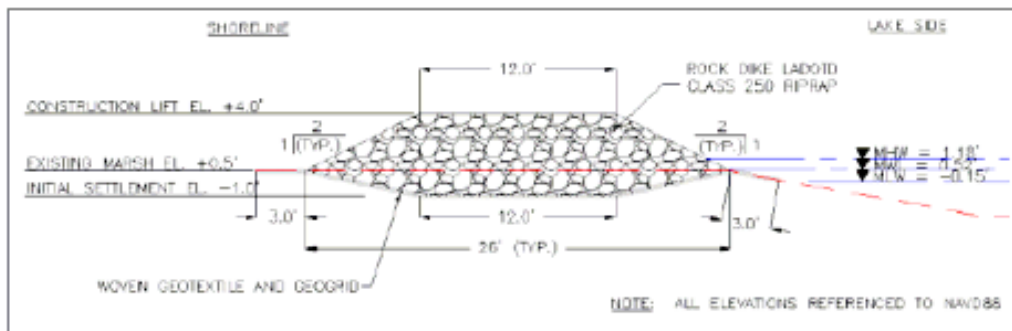


Figure 3 - Typical Section of Rock Breakwater Using End-On-Construction

Per CWPPRA program specifications, the PO-30 design life is 20 years. Additional project details are included in Appendix A.

**A bucket dredge will be utilized to excavate sediments and construct the flotation canal.** Approximately 281,461 cubic yards of material will be deposited on the lakeside of the flotation channel and graded down into the flotation channel after construction and/or maintenance of the rock breakwater are completed. Bucket dredging utilizes various types and sizes of buckets depending on the operational requirements of the project. The types of buckets typically used include clamshell, orangepeel, and dragline (USACE 1983). Bucket sizes typically range from 1 to 12 cubic yards. The dredge used to create the flotation channel for the Barataria Basin Landbridge Shoreline Protection, BA-27d CU #6 CWPPRA project, is shown in Figure 4. It is anticipated that the PO-30 contractor will use similar equipment to dredge the flotation canal. Once the dredge is positioned at the location where work is to start, anchors and spuds are lowered into place and the bucket is dropped in the open position through the water, penetrating into the bottom material. The sides or jaws of the bucket are then closed and the material is removed from the bottom and contained within the bucket compartment. The bucket is then raised above the water surface and swung to a point for material release. One advantage to the bucket dredge is that the volume of excess water is minimal, which increases the efficiency of moving material from the dredging area to the placement area (USACE 1983).



Figure 4 – Dredge utilized in the Barataria Basin Landbridge Shoreline Protection CWPPRA project (BA-27d, CU#6).

**For the PO-30 project, restrictions have been outlined for the avoidance of any incidental by-catch of Gulf sturgeon. Specifically, all contract personnel associated with the project will be informed of the potential presence of Gulf sturgeon. The preventive measures require that the contractor carefully observe the work area for the presence of the Gulf sturgeon at all times and take action to induce them to leave the immediate work area prior to dredging, regardless of water depth or time of year. To discourage Gulf sturgeons from entering or remaining in the work area (no depth limitations) prior to dredging, the bucket will be dropped into the water and retrieved empty. After the bucket is retrieved empty, a one-minute long, no-dredging period must be observed. During that no-dredging period, personnel will carefully observe the work area in an effort to detect Gulf sturgeon. If any sturgeons are sighted, the USFWS (337-291-3100) and Louisiana Department of Wildlife and Fisheries (LDWF), Natural Heritage Program (225- 765-2821) should be notified and no dredging should occur until the sturgeons have left the work area on their own accord. If water turbidity makes such visual observations impossible, dredging work will proceed after the one-minute no-dredging period. If more than fifteen minutes elapses with no dredging, then the above empty bucket/retrieval process shall again be conducted prior to dredging.**

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### 3.0 Gulf Sturgeon Characteristics

The Gulf sturgeon, *Acipenser oxyrinchus desotoi*, is a subspecies of the Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus*, and was first recognized as a subspecies in 1955 (FWRI 2007). In addition to genetic differences, the Gulf sturgeon differ from the Atlantic sturgeon in relative head length and pectoral fin length, shape of dorsal scutes (bony plates), and length and position of the spleen (FWRI 2007). Gulf sturgeons are anadromous fish (migrating seasonally between fresh and saltwater) that range primarily from the Suwannee River in Florida to the Mississippi River in Louisiana (USACE no date). Their distribution is limited to the Gulf of Mexico by the emergence of the peninsular Florida to the east and the Mississippi River to the west.

#### 3.1 Federal Status

USFWS and National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) designated the Gulf sturgeon to be a threatened subspecies, pursuant to the Endangered Species Act of 1973, as amended (ESA). The listing became official on September 30, 1991.

On March 19, 2003, USFWS and NOAA Fisheries published a final rule in the Federal Register (Volume 68, No. 53) designating critical habitat for the Gulf Sturgeon in Louisiana, Mississippi, Alabama, and Florida. Portions of the Pearl and Bogue Chitto Rivers, Lake Catherine, and Lake Borgne within Louisiana were included in that designation. The primary constituent elements essential for the conservation of Gulf sturgeon are those habitat components that support feeding, resting, sheltering, reproduction, migration, and physical features necessary for maintaining the natural processes. The seven primary constituent elements are:

1. abundant prey items within riverine habitats;
2. riverine spawning sites;
3. riverine aggregation areas, also referred to as resting, holding and staging areas;
4. a flow regime (i.e., the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time);
5. water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics;
6. sediment quality, including texture and other chemical characteristics; and
7. safe and unobstructed migratory pathways (e.g., a river unobstructed by a permanent structure, or a dammed river that still allows for passage) (USFWS 2007).

#### 3.2 Habitat

Critical habitat is defined by the Endangered Species Act of 1973 as a specific geographic area that is essential for the conservation of a threatened or endangered species. For the Lake Borgne project, the critical habitat for the Gulf sturgeon is identified in Figure 5 for Unit 8 including: Lake Pontchartrain, Lake St. Catherine, the Rigolets, Little Lake, Lake Borgne, and Mississippi Sound in Jefferson, Orleans, St. Tammany, Jefferson, Orleans, and St. Bernard Parishes in Louisiana; Hancock, Jackson, and Harrison Counties in Mississippi; and Mobile County, Alabama.

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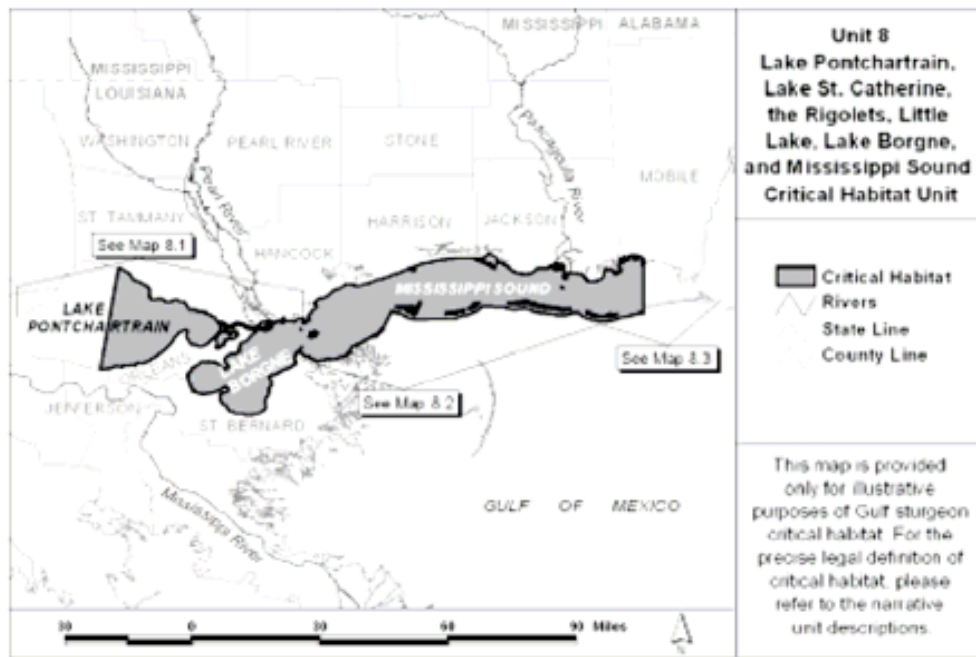


Figure 5 – Critical habitat map for Gulf sturgeon within the PO-30 vicinity

Gulf sturgeons are known to congregate in specific areas within the rivers during the summer and seldom move from these areas by more than about 0.6 km (USACE no date). These holding areas are characterized by short mid-depth (3-4 m) reaches of the river immediately below deep turbulent holes (>5m), and immediately above long sand shoals (2-3 m depth) (USACE no date). In laboratory studies, researchers have observed the substrate preferences of Gulf sturgeons (USACE no date). Individual sturgeon in high flows preferred cobbled substrates while individuals in low flow velocities showed no preference for substrate (USACE no date). Groups of Gulf sturgeon showed no substrate preference in high flow velocities (USACE no date). Cobble substrates and holes deeper than the channel bottom are believed to provide energetic refuges from high stream flow velocities for juvenile Gulf sturgeon (USACE no date).

Gulf sturgeons generally consume benthic-dwelling organisms such as isopods, amphipods, mollusks, crabs, grass shrimp, marine worms, and insect larvae (FWRI 2007). The juvenile sturgeon's diet is comprised of brackish-water amphipods, chironomid larvae, certapogonid larvae, aquatic insects, and small bivalves (USACE no date).

### 3.3 Distribution

The Gulf sturgeon historically ranged along the northeastern Gulf, in major rivers from the Mississippi Delta in Louisiana, east to Charlotte Harbor, Florida, and in marine waters of the central and eastern Gulf. Distribution of Gulf sturgeon in Louisiana extends from the Mississippi River east to the Pearl River. The majority of these sturgeons have their origins in the Pearl River system, where the largest population occurs. However, Gulf sturgeon have historically

inhabited many of the larger tributaries east of the Mississippi River, including some upstream of the Ross Barnett Dam (USACE no date).

The USACE recently completed a Biological Assessment (USACE no date) that provides detailed information related to catch data from Louisiana waterways that are not routinely sampled by LDWF. Specifically, the Biological Assessment reports:

Offshore: “Critical habitat for Gulf sturgeon extends from Lake Borgne/Rigolets along the gulf coast to the Suwannee Sound, Florida. From 2001 to 2004 LDWF netted and radio/sonic tagged Gulf sturgeon in the Pearl River system in an effort to determine their over-wintering habitats by tracking these fish as they exited the rivers. These tracking studies showed that once Gulf sturgeon leave the Pearl River system they travel east along the Mississippi coast feeding around barrier islands such as Horn, Ship, Cat and Petit Bois Islands. As of 2004, there were 50 active sonic tags on Louisiana Gulf sturgeon. In January of 2004, a remote sensing station on the northern-most tip of Chandeleur Island, LA picked up the sonic impulses of three different sturgeon as they passed within 0.5 miles of the island. In the 1970’s the LDWF, Seafood Division caught a Gulf sturgeon to the south of Pt. Chico in the Chandeleur Sound, St. Bernard Parish, LA, while trawling for pink shrimp (John Burdon, personal communication)” (USACE no date).

“In 2004, shrimpers working near Bay St. Louis, Mississippi, caught a Gulf sturgeon previously tagged by LDWF in the Bogue Chitto River that measured 20 inches long. D.K. Bradshaw reported three tag returns from Gulf sturgeon that were incidentally caught by shrimpers working in Mississippi Sound during the fall of 1985. Bradshaw originally collected these Gulf sturgeons from rkm 32 on the Pearl River earlier in 1985 (Parauka 2000). In January of 1994, a fisherman recaptured a Gulf sturgeon, previously tagged in the Bogue Chitto River by LDWF, in Oak River Bay, St. Bernard Parish, LA.” (USACE no date).

Lake Pontchartrain, Lake Catherine, Lake Borgne and the Rigolets: Critical habitats for Gulf sturgeon include the eastern half of Lake Pontchartrain, the Rigolets, Lake Catherine, Little Lake and Lake Borgne. In 2002, LDWF Seafood Division reported the capture of a Gulf sturgeon in one of their gill nets while sampling in a cove west of Alligator Point, Lake Borgne. A LDWF trammel net study conducted by Inland Fisheries Division in the spring of 2001 resulted in the capture of three young of the year juvenile sturgeon at the intersection of the East Pearl River and Little Lake. From 1988 to 1999, LDWF, through various means and studies captured and recorded at least 60 Gulf sturgeons throughout Lake Pontchartrain, Lake Catherine, the Rigolets and Lake Borgne. Telemetry of sonic tagged sturgeon has shown heavy use of the Rigolets by sturgeon during migratory movements. Davis et al (1970) reported the collection of Gulf sturgeon from Lake Pontchartrain during a LDWF anadromous fish survey from 1966 to 1969.” (USACE no date)

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“Recreational and commercial fishermen caught 177 Gulf sturgeons measuring up to 220 cm in length and weighing from 1 to 69 kg in these lakes and in the Rigolets from October 1991 to September 1992 (Rogillio 1993). Reynolds (1993) reported that sturgeon measuring up to 220.0 cm in length and weighing up to 117.3 kg were incidentally caught by shrimp trawlers netters and recreational anglers from 1889 to 1993 in Lake Pontchartrain. A Gulf sturgeon, weighing 175.9 kg was caught in Lake Borgne in a shrimp trawl in 1978 (Sportsmen of Slidell, 2000).” (USACE no date):

“MRGO: The MRGO is a man-made navigational channel that originates the inner harbor navigation canal in eastern New Orleans, Louisiana, and cuts southeasterly through the marsh into the Breton Sound. Presently, no critical habitat has been established for this channel.” (USACE no date).

“In 1990, LDWF’s Seafood Division captured a Gulf sturgeon previously tagged in the Bogue Chitto River, weighing 6.5 lbs and measuring 32 inches, in a trammel net set in Lena’s Lagoon off the MRGO. In January 2005, the USACE Engineering and Research and Development Center (ERDC) biologists tracked a sturgeon in the MRGO near the Breton Sound Marina as it moved from the channel into marshes adjacent to the channel. This fish had been tagged in the Bogue Chitto in August of the same year and had a fork length of 33.25 inches and weighed 6.7 lb at the time of capture.” (USACE no date)

“A commercial fisherman reported catching a Gulf sturgeon in the fall of 1983 in Violet Canal that was 6 feet long (D. Walther, personal communication). Violet Canal connects the wetlands to the west of the MRGO to the MRGO. A commercial fisherman reported taking a Gulf sturgeon 7 feet long and 170 lbs in weight in his trawl in Bayou Bienvenue in 1974 (D. Walther, personal communication). Bayou Bienvenue connects Lake Borgne and the MRGO.” (USACE no date).

“Pearl River: Originating above Jackson, MS and flowing into the Rigolets and Lake Borgne, the Pearl River drains approximately 22,690 km<sup>2</sup> in central Mississippi. Barriers to fish migration occur at the Ross Barnett Dam, river kilometer (rkm) 486, and at the Pools Bluff Sill, rkm 78.3 (Morrow et al 1998). In 1956 the USACE completed the Pearl River Navigation Project which was designed to aid commercial barge navigation westward to Bogalusa, LA. Three locks and three low water sills were added to the river/canal system to maintain water levels for barge traffic (Figure 18). The sills were placed on the Pearl River at Pools Bluff north of lock 3, on the Bogue Chitto River south of lock 3, and on Talisheek Creek between locks 1 and 2. These low water sills obstruct up to 407.7 rkm of potential sturgeon spawning and summer habitat between Ross Barnett and Pools Bluff during critical spring migration. The sills on the Bogue Chitto River and Pearl River are barriers to sturgeon passage for as many as 292 days per year

(Morrow et al 1998) depending on river stage. Critical habitat for this river extends from its mouth to the Ross Barnett Dam near Jackson, MS” (USACE no date).

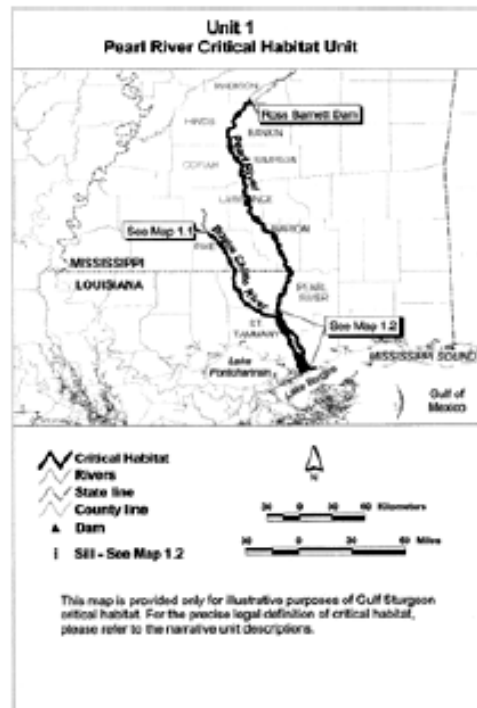


Figure 6 - Critical Habitat Map for the Pearl River

“Pearl River Gulf sturgeon populations appear to have recovered substantially from levels reported in the mid 1990s with noticeable improvements in the population’s size distribution characteristics. The population in the mid 1990s was estimated at approximately 300 fish, with only 3 percent of the population adults. High annual mortality rates of 34 percent were estimated for the 1995-1996 season. Morrow et al (1999) suggested that the Pearl River Gulf sturgeon population would be self-sustaining if the number of adults was at least 100, recruitment was satisfactory, and annual mortality was less than 15 percent. In 2004, the Pearl River population contained 100+ adults and recruitment was satisfactory with numerous juveniles captured. The total annual mortality rate for the population was estimated at 7 percent and the population appeared to be self sustaining. Five Gulf sturgeons have been collected between Pools Bluff sill and Ross Barnett Dam since 1970 indicating some upstream migration over Pools Bluff sill.” (USACE no date).

No documented Gulf sturgeon captures or sightings have occurred in the following waterways:  
 Baptiste Collette Bayou, Bayou Bonfuca, Bayou Dupre’, Bayou Lacombe, Bayou La Loutre,

Bayou Manchac, Bayou St. Malo, Bayou Yscloskey, the Blood River, the GIWW, Michoud Canal, the Mississippi River, the Natalbany River, Pass Manchac, the Pontchartroula River, South Pass, Southwest Pass, nor any rivers west of the Mississippi River (USACE no date). LDWF studies have shown a Gulf sturgeon presence in Lake Borgne and Lake Pontchartrain during the winter months and during migration to and from marine environments (USACE no date).

#### 3.4 Spawning Habitat and Reproduction

Gulf sturgeons reside in the estuaries and coastal shelf regions of the Gulf of Mexico during the cooler months from October to March. In March and early April, adult sturgeons start their migration into the freshwater rivers in search of spawning habitat. Non-ripe adults, juveniles and subadults also participate in this yearly migration, but usually lag behind the spawning adults moving into the rivers anywhere from day to months later (USACE no date). The Gulf sturgeon typically spawns for about three weeks in the spring over clean gravel beds and limestone substrates. Fall spawning has not been observed in any of the referenced project area rivers (USACE no date). Riverbed topography, determining where gravel accumulates, where strong currents prevail, and where eddy fields develop, plays a fundamental role in determining sturgeon spawning sites (USACE no date). Water flow is also an important feature of sturgeon spawning habitat.

#### 3.5 Reasons for Decline

Gulf sturgeons have historically supported both commercial and recreational fisheries throughout most of their range from the Mississippi River east to Tampa Bay. Reasons for the decline include: fisheries over-exploitation, spawning habitat loss via dam construction and deterioration of water quality in their natal rivers (USACE no date). Sturgeons are particularly vulnerable to gill net fisheries and are also found in the bycatch of shrimp trawls. Even though sturgeon fishing regulations are in place, poaching of Gulf sturgeon still occurs. Literature reviews have indicated that restrictions applied to the sturgeon fisheries have not resulted in the restoration of population size. This may be due to the reduction of suitable spawning habitat. The reduction of suitable spawning habitat results from dredging operations, dams and low water sills, and low dissolved oxygen levels. Dredging operations may impact spawning habitat as a result of the reduction in the number of deeper holes and hard substrate areas. Dams and low water sills prevent the movement of spawning adults to traditional spawning grounds. Additionally, low dissolved oxygen levels from eutrophication also contribute to spawning habitat degradation. Adults and subadults are not greatly affected by changes in salinity, dissolved oxygen, or high temperatures, however, eggs and larval stages of the sturgeon have low tolerance ranges for these criteria (USACE no date).

#### 4.0 Impact Analysis of PO-30 on Gulf Sturgeon

Effects to Gulf sturgeon would be confined to the direct impacts associated with the dredging flotation access. **LDNR and all contractors will be informed to abide by the dredging procedures outlined in Section 2.0 to avoid or minimize any impacts to Gulf sturgeon.**

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A "Take" of a listed species is defined in the Endangered Species Act and implementing regulations as the act or attempted act of pursuing, hunting, shooting, wounding, killing, trapping, capturing, collecting, harming, or harassing. Harm and harass are defined as the act of disturbing individuals or modifying habitat to the extent that wildlife are actually killed or injured by impairment of essential behavioral patterns such as breeding, feeding or sheltering.

**Controls will be implemented to ensure that the project activities are conducted first to avoid, and otherwise to minimize, the potential effects on the Gulf sturgeon. Specifically: 1) a bucket dredge will be used for all dredging work; 2) all construction personnel will be reminded of the potential presence of Gulf sturgeon within the project area and instructed on what to do should a sturgeon be sighted within the work zone; and 3) the threatened species will be discouraged from entering or remaining in the work area (no depth limitations) prior to dredging by dropping the dredge bucket into the water and retrieving the bucket empty. After the bucket is retrieved empty, a one-minute-long, no-dredging period will be observed. During that no-dredging period, personnel will carefully observe the work area in an effort to detect Gulf Sturgeon. If a Gulf sturgeon is sighted, the USFWS (337-291-3100) and the LDWF, Natural Heritage Program (225-765-2821) will be notified and no dredging will occur until the sturgeon has left the work area on its own accord. If the water turbidity makes such visual observations impossible, dredging work will proceed after the one-minute, no-dredging period. If more than fifteen minutes elapses with no dredging, then the above empty bucket/retrieval process shall again be conducted prior to dredging.**

The primary and potentially unavoidable adverse effects are the immediate impacts from construction related sediment excavation and deposition on the non-mobile benthic organisms in areas adjacent to specific project features; and minor and temporary disturbance to adjacent wetlands, water and air quality. The effects on water quality, air quality, and the noise generated by the proposed project will be of a temporary nature and occur only during construction. Through the implementation of the previously mentioned controls and dredging procedures, any potential adverse effects to the Gulf sturgeon as a result of PO-30 will be avoided or minimized.

The potential for a Take as a result of constructing and/or implementing the PO-30 project is highly unlikely. The Gulf Sturgeon will benefit as a result of the marsh conservation efforts on a scale greater than any likely incidental Take. Therefore, PO-30 is not likely to adversely affect the Gulf sturgeon.

## **5.0 Project Impact Analysis: Gulf Sturgeon Critical Habitat**

Impacts of PO-30 to the seven primary constituent elements essential for the conservation of the Gulf sturgeon (USFWS 2007) have been assessed and are presented below.

### **5.1 Primary Constituent Element 1**

Food items within estuarine and marine habitats and substrates for subadult and adult life stages (detritus, aquatic insects, worms, and/or mollusks, within riverine habitats for larval and juvenile

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life stages; and abundant prey items, such as amphipods, lancelets, polychaetes, gastropods, ghost shrimp, isopods, mollusks and/or crustaceans) (USFWS 2007).

Minimal alteration of Gulf sturgeon critical habitat in Unit 8, due to the implementation of PO-30, is likely. The project alignment including flotation canal and temporary material placement are provided in Appendix A. The general habitat areas for the project area are shown in Table 1. The disturbed habitat acres as a result of PO-30 are shown in Table 2.

Table 1. - Habitat Analysis at TY0 and TY20 (EPA 2005)

	Bayou Dupre' West	Bayou Dupre' East	Shell Beach	Bayou Dupre' and Shell Beach	Bayou Dupre' and Shell Beach	Bayou Dupre' and Shell Beach
	Acres TY0	Acres TY0	Acres TY0	Total Acres TY0 Existing Condition	Total Acres TY20 Future w/Project	Total Acres TY20 Future wo/Project
Marsh	47	23	94	164	164	0
wetland shrub scrub	0	0	1	1	1	0
marsh water	6	5	16	27	27	192
Total	53	28	111	192	192	192

Table 2 - The number of disturbed habitat acres as a result of PO-30 (Haynes 2005)

Design Element	Number of Acres
Temporary storage of Flotation Dredged Materials	29.50
Excavation for Flotation Access and Channels	59.80
Waterbottoms Permanently Disturbed by Stone Structure	2.40
Waterbottoms Permanently Disturbed by Steel Sheet Pile Structure	0.85
Land Permanently Disturbed by Stone Structure	15.80
Total:	108.35

Approximately 110 acres will be disturbed as a result of PO-30, of which 92.55 acres are waterbottoms and critical habitat for Gulf sturgeon. Less than 4% (3.25 acres) of the total disturbed critical habitat in the vicinity of PO-30 is considered permanently disturbed as a result of PO-30. The permanent (and temporary) disturbed acreages are considered very small in relationship to the total number of critical habitat acres contained in Unit 8 as shown in Figure 7.

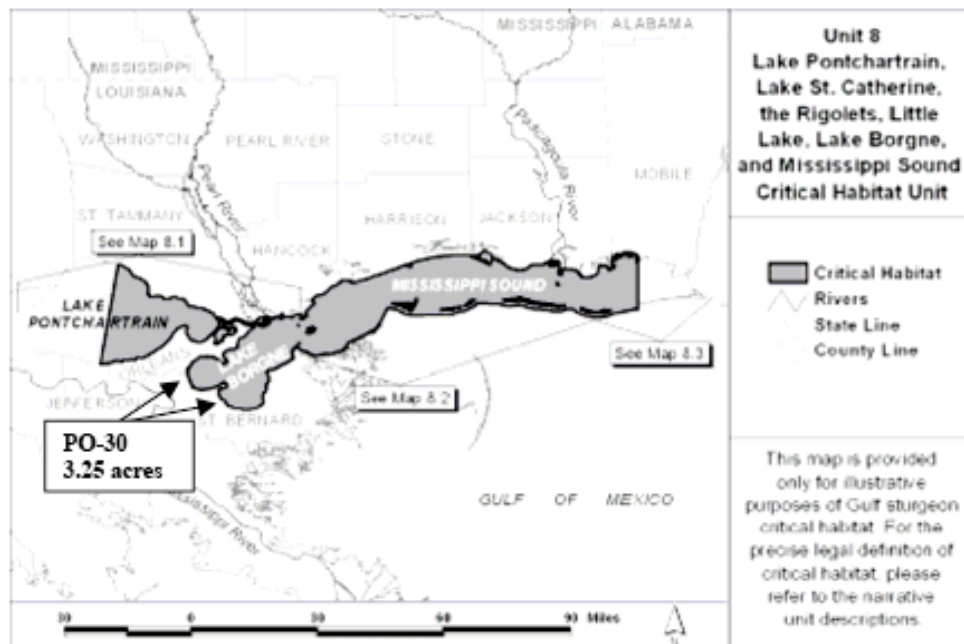


Figure 7 - Critical habitat map for Gulf sturgeon relative to PO-30

The PO-30 project features are needed to halt the retreat of the Lake Borgne shoreline, the loss of marsh in the vicinity of Shell Beach and Bayou Dupre', and enhance fish and wildlife habitat. The marshes separating the MRGO from Lake Borgne are broken by many ponds and are suffering from both shoreline and bank erosion in the Shell Beach and Bayou Dupre' areas. Carbon and energy flow through estuarine benthic communities is typically dominated by detritus originating in adjacent tidal marshes. By protecting the remaining wetlands on the southern shore of Lake Borgne, PO-30 is protecting one of the main carbon and energy sources for the benthic organisms in Lake Borgne, on which the sturgeon feed.

PO-30 will temporarily impact the benthic-dwelling organisms within the beachfront area that serves as potential prey items for the Gulf sturgeon. However, these impacts are primarily short-term in nature and consist of a temporary loss of benthic organisms in the areas of the dredging and placement operations. PO-30 will temporarily disturb benthic habitat on the southern shore of Lake Borgne through dredging of a flotation channel for access using a bucket dredge, and subsequent deposition of dredged material at an adjacent temporary subaqueous disposal area. These combined areas constitute the area of benthic habitat to be temporarily impacted. The flotation channel will subsequently be backfilled. Impacts of dredging activities to Gulf estuarine benthic communities have been shown to be temporary. Only a very small percentage of the total habitat acreage (3.25 acres) is permanently disturbed by the footprint of the project structures. In addition, Gulf sturgeon have been known to travel long distances (over 100 miles) during their winter feeding phase (USFWS 2003). Dredging activities associated with construction of the flotation channels would increase turbidity in the area of work. These conditions will be

temporary and short-lived. After PO-30 implementation, there remains an abundant foraging area for the sturgeon. Additional preventive measures include prohibiting access to or movement across the strip of marsh outside the defined project area within vegetated areas for all personnel and equipment to protect existing vegetation. The PO-30 plans and specifications state vegetated areas shall not be used for equipment, personnel or material access or storage and the dredged fill shall be discharged within the designated areas in a manner that will minimize overflow of the dredged material from the bounds of its placement area. Protecting the existing marsh supports the food web for the Gulf sturgeon.

Although temporary disturbances to the benthic organisms and benthic habitat will occur, these impacts are temporary, and there is an abundance of suitable habitat (including designated critical habitat) in proximity to the PO-30 area. Constructing PO-30 and protecting remaining marsh will safeguard the forage base for the Gulf sturgeon since benthic organisms are largely supported by organic matter produced in adjacent wetlands. Therefore, PO-30 is not likely to adversely affect this primary constituent element of the designated critical habitat for the Gulf sturgeon.

#### 5.2 Primary Constituent Element 2

Riverine spawning sites (with substrates suitable for egg deposition and development, such as limestone outcrops and cut limestone banks, bedrock, large gravel or cobble beds, marl, soapstone, or hard clay) (USFWS 2007).

The PO-30 project area is on the southern shore of Lake Borgne, in subtidal estuarine habitat. This is not spawning habitat for the Gulf sturgeon. Spawning habitat for the Gulf sturgeon consists of freshwater rivers with the above substrate types. This project will not affect those habitats. Therefore, this project is not likely to adversely affect this primary constituent element of the designated critical habitat for the Gulf sturgeon.

#### 5.3 Primary Constituent Element 3

Riverine aggregation areas (also referred to as resting, holding, and staging areas, used by adult, subadult, and/or juveniles, generally, but not always, located in holes below normal riverbed depths, believed necessary for minimizing energy expenditures during fresh water residency and possibly for osmoregulatory functions) (USFWS 2007).

The project area is on the southern shore of Lake Borgne, in subtidal estuarine habitat. This is not a riverine aggregation area for the Gulf sturgeon. Riverine aggregation areas for the Gulf sturgeon consist of sites in freshwater rivers. This project will not affect those habitats. Therefore, this project is not likely to adversely affect this primary constituent element of the designated critical habitat for the Gulf sturgeon.

#### 5.4 Primary Constituent Element 4

Flow regime (i.e., the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time necessary for normal behavior, growth, and survival of all life stages in the riverine environment, including migration, breeding site selection, courtship, egg fertilization, resting, and staging, and for maintaining spawning sites in suitable condition for egg attachment, egg sheltering, resting, and larval staging) (USFWS 2007).

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This primary constituent element specifically addresses the riverine environment, so therefore, is not relevant to this project (see above). Therefore, this project is not likely to adversely affect this primary constituent element of the designated critical habitat for the Gulf sturgeon.

#### 5.5 Primary Constituent Element 5

Water quality (temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages) (USFWS 2007).

This project is not likely to result in significant changes in water temperature, salinity, pH, hardness, oxygen concentration, or other chemical characteristics. Dredging of the flotation channel will temporarily increase turbidity in the immediate project area, primarily during the actual dredging activity; however, restricting the contractor to using a bucket dredge provides more control over the dredging process (USACE 1983). The increase in turbidity is not anticipated to be excessive nor persist long after dredging is completed. The areal extent of dredging and associated turbidity is minor as compared to the habitat acreage readily available for the Gulf sturgeon. Efforts to discourage the sturgeon from the project area will limit their exposures to the temporarily more turbid waters. Threats and potential threats to the Gulf sturgeon identified in the listing rule include poor water quality associated with contamination by pesticides, heavy metals, and industrial contaminants; aquaculture and incidental or accidental introductions (USFWS 2003). PO-30 project will not increase contamination, nor will contaminants be released during construction. Therefore, this project is not likely to adversely affect this primary constituent element of the designated critical habitat for the Gulf sturgeon.

#### 5.6 Primary Constituent Element 6

Sediment quality (texture and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages) (USFWS 2007).

Based on information in the Soil Survey of St. Bernard Parish, Louisiana, soil types present in the Shell Beach project area include Clovelly muck, between Bayou Yscloskey and Fort Bayou, and Fausse clay, primarily along the shore between Bayou Yscloskey and Doulluts Canal. The soil type in the Bayou Dupre' project area is Clovelly muck. Clovelly muck is characteristic of brackish marshes and shallow open water areas flooded most of the time and wet throughout the year. It is very poorly drained, very fluid, and slightly saline organic soil. It is neutral to moderately alkaline with a pH ranging from 6.6 to 8.4. The surface layer is dark brown extending about 50 inches; the underlying layer is very fluid gray clay extending about 70 inches. Clovelly muck soil is well suited for wetland wildlife habitat and, combined with the brackish marshes and shallow open water areas, they support marine life of the Gulf of Mexico. Fausse clay is a very poorly drained, firm mineral soil found in swamps on subsided natural levees of distributaries of the Mississippi River. It is neutral to strongly alkaline, with a pH ranging from 6.1 to 9.0. The surface layer is about 5 inches thick and consists of dark grayish brown, very fluid clay in the upper part, and dark gray, firm clay in the lower part. The underlying material extends about 60 inches and is gray, firm clay. Fausse clay is used as habitat for wetland wildlife.

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The geotechnical investigation presented in the Lake Borgne Shoreline Protection Project Final Design Report (LDNR 2005) states that a total of twenty-four subsurface borings were drilled along the shoreline of the project area beginning on February 17, 2002 by Louis J. Capozzoli & Associates, Inc. Fourteen borings were drilled near Shell Beach (Figure 8) and ten borings were drilled near Bayou Dupre' (Figure 9). The borings ranged in depth from 15 to 50 feet, and were sampled continuously to the 10-foot depth and on 5-foot centers thereafter.



Figure 8 - Geotechnical Borings Near Shell Beach



Figure 9 - Geotechnical Borings Near Bayou Dupre'

Selected soil samples were tested in the laboratory for classification, strength, and compressibility. The soil boring logs are provided in Appendix B. In general, the soils along the southern shoreline of Lake Borgne and PO-30 project area are very soft organic clays, peats and clays near the surface followed by several feet of very soft clays and silts. The shear strength and

bearing capacity generally increases from the west to east along the project boundary. Sediment along the southern shore of Lake Borgne is overwhelmingly dominated by silt and clay fractions. Gulf sturgeon show a preference for sandy shoreline habitats most likely because their known prey items are present (USFWS 2003). Sand is not known to occur in the PO-30 project area. Although the project will temporarily disturb a small area of sediment as previously discussed, it will not affect the existing sediment quality. Therefore, PO-30 is not likely to adversely affect this primary constituent element of the designated critical habitat for the Gulf sturgeon.

#### 5.7 Primary Constituent Element 7

Safe and unobstructed migratory pathways (necessary for passage within and between riverine, estuarine, and marine habitats; e.g., an unobstructed river or a dammed river that still allows for passage) (USFWS 2007).

PO-30 will result in the construction of a rock dike at the wetland/water interface on the southern shore of Lake Borgne. No other potential obstructions are to be created. The primary migration pattern through the area would be parallel to the shoreline project area. The proposed action is occurring in an open-water environment allowing sufficient area for passage of sturgeons. If dredging is occurring during a migratory passage, sufficient space will remain for the sturgeon to migrate through the area if it so chooses. No significant short-term or long-term effects to migratory passage have been identified. Since the Gulf sturgeon is not known to forage on the marsh surface per se, this project is not likely to adversely affect this primary constituent element of the designated critical habitat for the Gulf sturgeon.

### 6.0 Recommendations and Conclusions

As discussed previously, during the winter months, juvenile and adult Gulf sturgeon use estuarine and marine habitats for foraging activities. Sturgeons migrate to river mouths and upstream areas during the spring in search of spawning and resting habitat. They migrate back into the estuaries and marine habitats in the fall season in search of suitable benthic prey species, their primary source of food. It is possible that Gulf sturgeon may be present within the PO-30 project area and to avoid impacts to the sturgeon during the fall and spring migrations, dredging operations will be targeted for May 1<sup>st</sup> through September 30<sup>th</sup>. Since it is possible dredging will occur prior to, or after the fall and spring migrations, the contractors will be made aware of the possibility for increased Gulf sturgeon presence in the project area, and they will be required to implement preventive measures.

The preventive measures require the contractor use a bucket dredge, carefully observe the work area for the presence of the Gulf sturgeon at all times, and take action to induce them to leave the immediate work area prior to dredging, regardless of water depth or time of year. To discourage Gulf sturgeons from entering or remaining in the work area (no depth limitations) prior to dredging, the bucket will be dropped into the water and retrieved empty. After the bucket is retrieved empty, a one-minute long, no-dredging period must be observed. During that no-dredging period, personnel should carefully observe the work area in an effort to detect Gulf sturgeon. If sturgeons are sighted, the USFWS (337-291-3100) and LDFW Natural Heritage

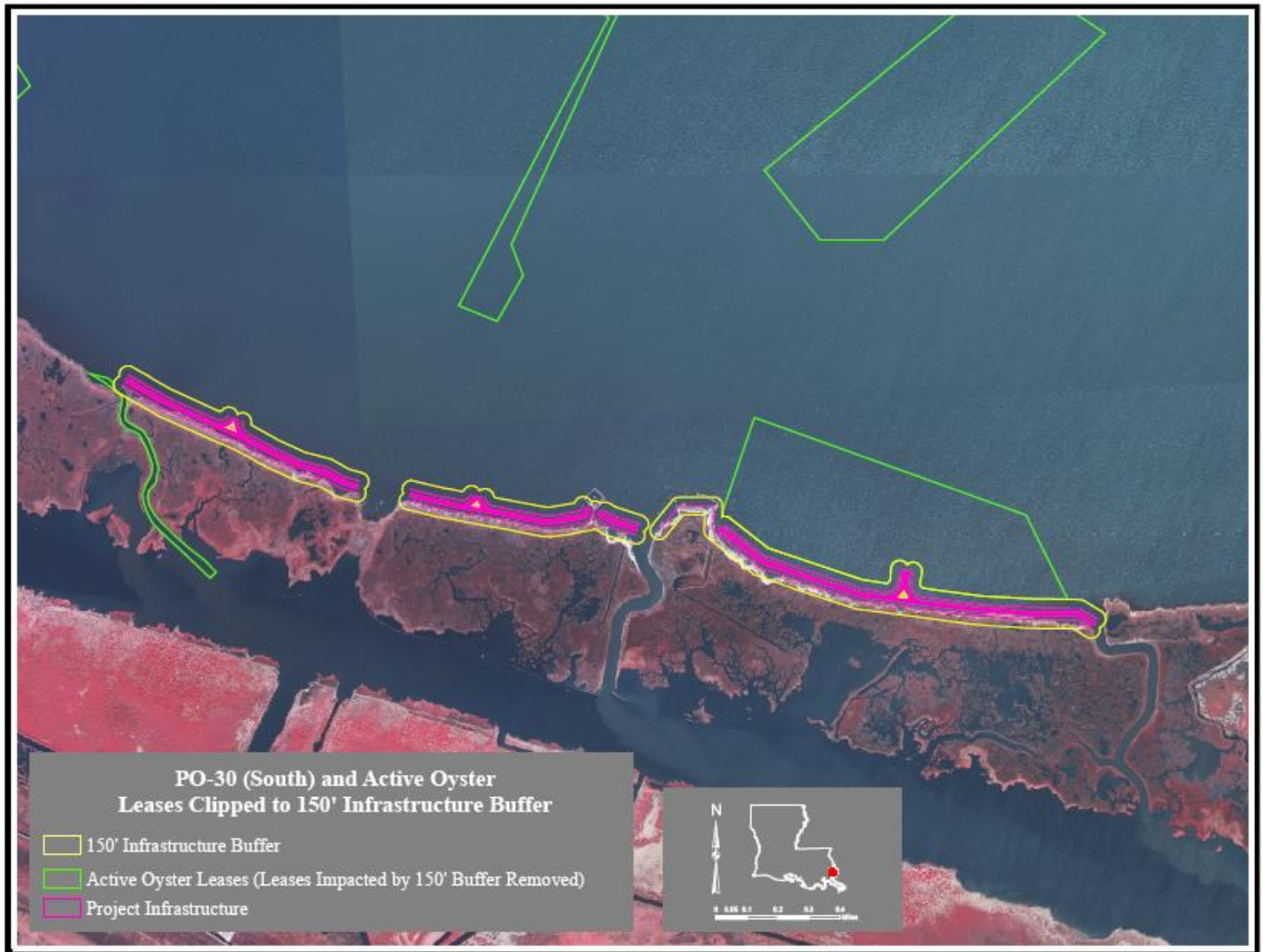
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Program (225-765-2821) should be notified and no dredging should occur until the sturgeon have left the work area on their own accord. If water turbidity makes such visual observations impossible, dredging work will proceed after the one-minute no-dredging period. If more than fifteen minutes elapses with no dredging, then the above empty bucket/retrieval process shall again be conducted prior to dredging. Implementing these measures should minimize any adverse effects to the Gulf sturgeon and the primary constituent elements of the designated critical habitat. PO-30 benefits and helps to support the primary constituent elements essential for the conservation of Gulf sturgeon.

Based upon the findings of this biological assessment, the PO-30 project has been determined "not likely to adversely affect" the Gulf sturgeon and "not likely to adversely affect" the primary constituent elements of critical habitat for the Gulf sturgeon.

## 7.0 References

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- U. S. Environmental Protection Agency Region 6 (EPA). (2006). Finding Of No Significant Impact dated December 1, 2005 and Environmental Assessment for the Lake Borgne Shoreline Protection Project (PO-30) St. Bernard Parish, Louisiana.
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- Haynes, S. (2005). Personal communications with Mr. Shannon Haynes, P.E., Engineer, Engineering and Design Section, Coastal Engineering Division, Louisiana Department of Natural Resources, Baton Rouge, Louisiana.
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- U.S. Army Corps of Engineers (USACE). (no date). Biological Assessment, Impacts of USACE Navigational Projects on the Gulf Sturgeon in Louisiana.
- U.S. Fish and Wildlife Service (USFWS). (2003). Federal Register Volume 68, No. 53, Wednesday, March 19, 2003. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Gulf Sturgeon. <http://www.nmfs.noaa.gov/pr/pdfs/fr/fr68-13370.pdf>  
Site accessed: March 14, 2007.
- U.S. Fish and Wildlife Service (USFWS). (2007). <http://www.fws.gov/alabama/ga/gafaq.htm>  
Site accessed: March 13, 2007.
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Any and all oyster leases, or portions thereof, determined by the Louisiana Department of Natural Resources to be directly impacted by this project will be acquired, prior to project construction, pursuant to the Oyster Lease Acquisition and Compensation Program as set forth in LSA-R.S. 56:432.1. However, the contractor must follow the access routes provided by the department in order to avoid potential damage to other oyster leases in the vicinity of the project area. For this project the area of direct impact has been designated as a 150 foot buffer around each project feature. Direct impacts include, but are not limited to, the physical location upon which dredging, direct placement of dredged or other materials, or other work or activities necessary for the construction or maintenance of a project is planned to occur or has occurred.

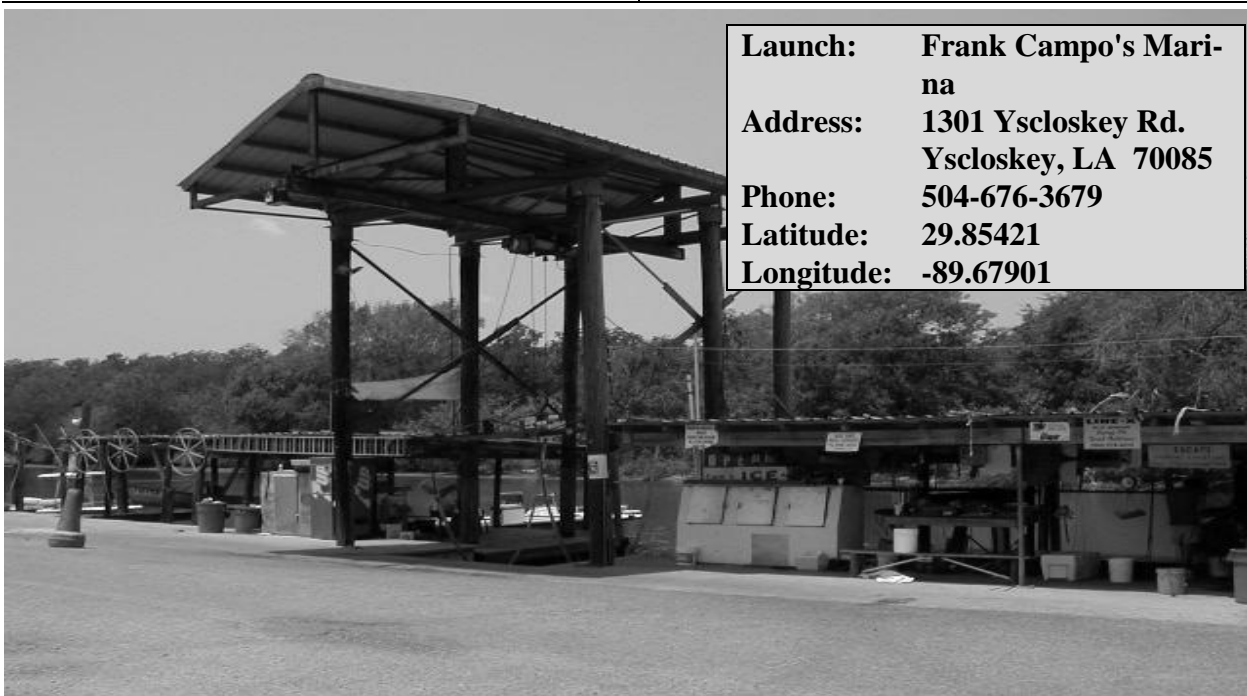


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**APPENDIX D: DIRECTIONS TO BOAT LAUNCHES**

Directions to Launch at Shell Beach

From New Orleans take I-10 East to the Chalmette (I-510) exit take a right and cross the Paris Road Bridge. Continue on till you get to Highway 39 (Judge Perez Highway). Take a left onto Highway 39 and continue on across the bridge at Violet Canal. Take a left onto Hwy. 46 and continue until reaching the intersection at Highway 624. Take a left onto Highway 624 and continue to the Yscloskey Bridge. Cross the bridge and take a left onto Highway 24. Frank Campo's Marina is located at the end of Highway 24 on the left.

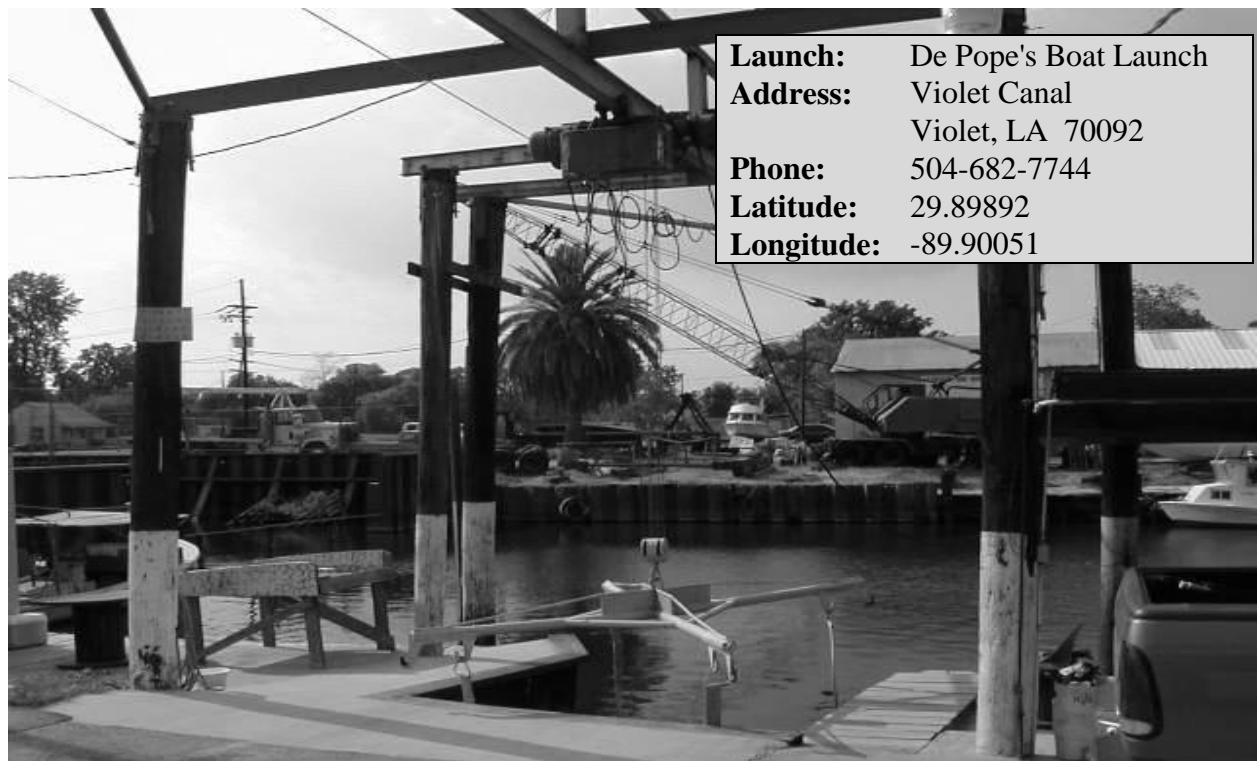
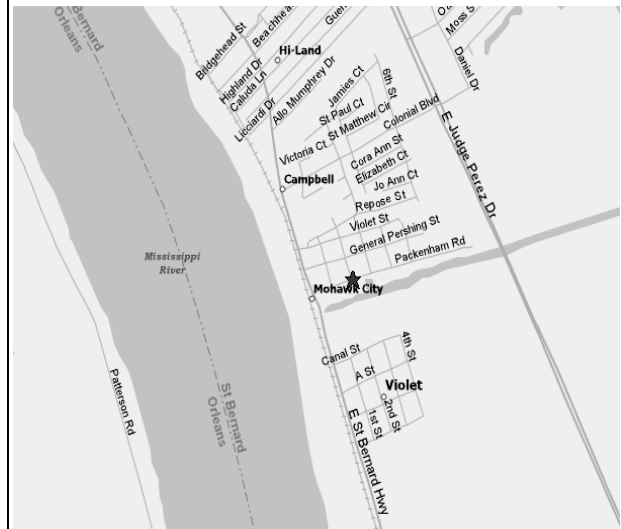
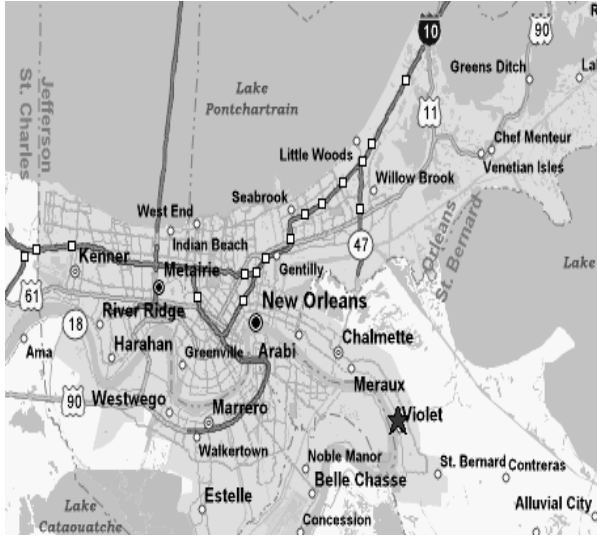


<b>Launch:</b>	<b>Frank Campo's Marina</b>
<b>Address:</b>	<b>1301 Yscloskey Rd. Yscloskey, LA 70085</b>
<b>Phone:</b>	<b>504-676-3679</b>
<b>Latitude:</b>	<b>29.85421</b>
<b>Longitude:</b>	<b>-89.67901</b>



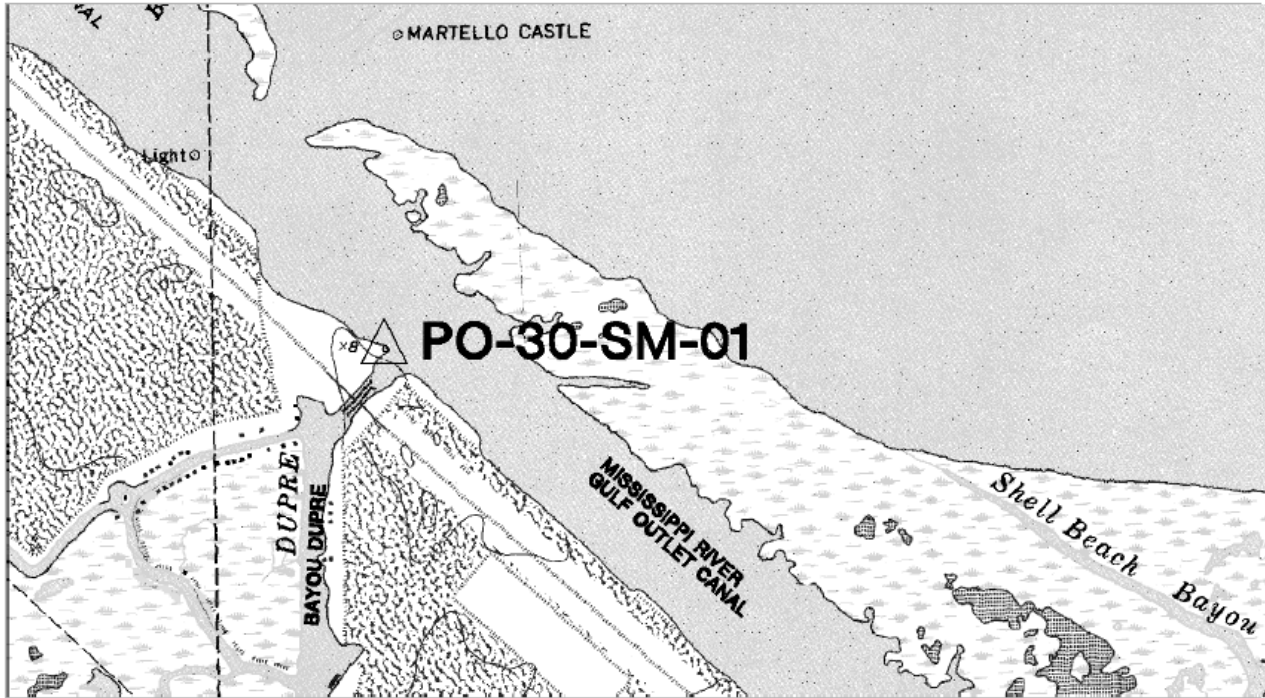
Directions to Launch at Bayou Dupre

From New Orleans take I-10 East to the Chalmette AKA I-510 exit take a right and cross the Paris Road Bridge. Continue on till you get to Hwy. 39 AKA Judge Perez Highway. Take a left on Hwy. 39 Judge Perez Highway and continue on. Take left at Packenham Road. De Pope's Boat Launch is on the right.



<b>Launch:</b>	De Pope's Boat Launch
<b>Address:</b>	Violet Canal Violet, LA 70092
<b>Phone:</b>	504-682-7744
<b>Latitude:</b>	29.89892
<b>Longitude:</b>	-89.90051

**APPENDIX E: LDNR SECONDARY MONUMENTS**



**VICINITY MAP** Scale: 1" = 2000'

Reproduced from USC&GS "Martello Castle" Quadrangle

**Station Name: "PO-30-SM-01"**

**Location:** The monument stamped "PO-30-SM-01" is located near Shell Beach, Louisiana. From the intersection of Paris Road and LA Hwy. 39 (Judge Perez Road) in Chalmette proceed east on LA Hwy. 39 for 8.1 miles to the intersection of LA Hwy. 39 and LA Hwy. 46 near St. Bernard High School. Proceed east on LA Hwy. 46 for 6.3 miles to a levee on the left. Follow the levee for approximately 7.7 miles to the Bayou Dupre Floodgates. The monument is located at the intersection of the west bank of Bayou Dupre and southern bank of the Mississippi River Gulf Outlet Canal. It is approximately 800 ft. northeast of the northern wing wall of the Bayou Dupre flood control structure behind the rip-rap lined bank. Access across the flood control structure should be coordinated with the St. Bernard Parish Levee District.

**Monument Description:** NGS style floating sleeve monument; datum point set on 9/16" stainless steel sectional rods driven 28 feet to refusal, set in sand filled 6" PVC pipe with access cover set in concrete, flush with ground.

**Stamping:** PO-30-SM-01

**Installation Date:** 2003 **Date of Survey:** Nov. 19-21, 2003

**Monument Established By:** Sigma Consulting Group, Inc.

**For:** Louisiana Department of Natural Resources, CRD

**Adjusted NAD 83 Geodetic Position**

Lat. 29°56' 10.33674" N  
 Long. 89°50' 08.86486" W

**Adjusted NAD 83 Datum LSZ (1702) Feet**

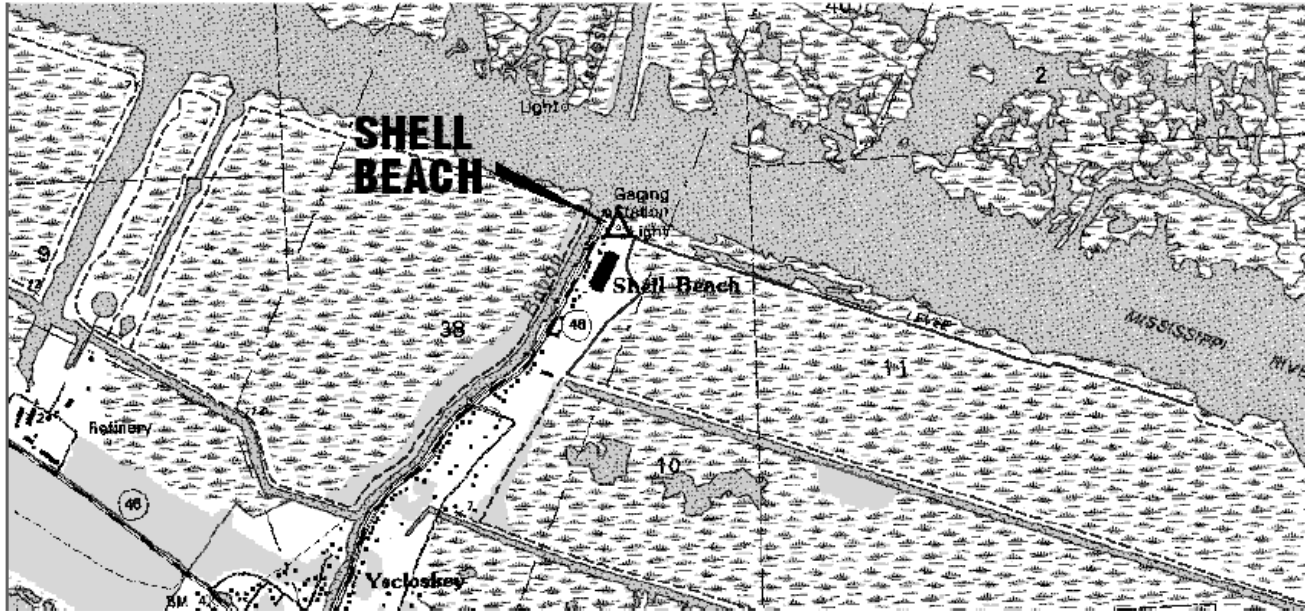
N= 525,391.96  
 E= 3,755,141.43

**Adjusted NAVD88 Height**

Elevation = 2.53 feet (0.772 mtrs)  
 Geoid99 Height = -26.109 mtrs.  
 Ellipsoid Height = -25.338 mtrs.



*Adjusted Position Established for Louisiana Department of Natural Resources, Coastal Restoration Division*



**VICINITY MAP**

Scale 1" = 2000'

Reproduced from USC&G "Ysclosky" Quadrangle

**Station Name:** "SHELL BEACH 2002"

**Monument Location:** From the intersection of LA Hwy 46 & LA Hwy 300 in Reggio at the flashing signal light at the "The Junction Store", proceed east on LA Hwy 46 approximately 4.6 miles to a drawbridge. Proceed north across drawbridge over Bayou La Loutre to the intersection of LA Hwy 46 & LA Hwy 624, then head west 0.2 miles to a road that turns north along Bayou Ysclosky. Proceed north along winding road on the east side of Bayou Ysclosky for 1.2 miles to the end of the road at the Intracoastal Waterway. Mark is on the right (east side) of the road on the south edge of a shell parking area. 175 feet east of centerline of road; 75 feet Southeast of wood pole with meter; located at south edge of shell parking area.

**Monument Description:** Stainless steel rod driven to point of refusal (72' deep) within a sleeve and protective cover set in concrete and stamped "Shell Beach 2002".

**Date:** March 2002

**Monument Established by:** BFM Corporation

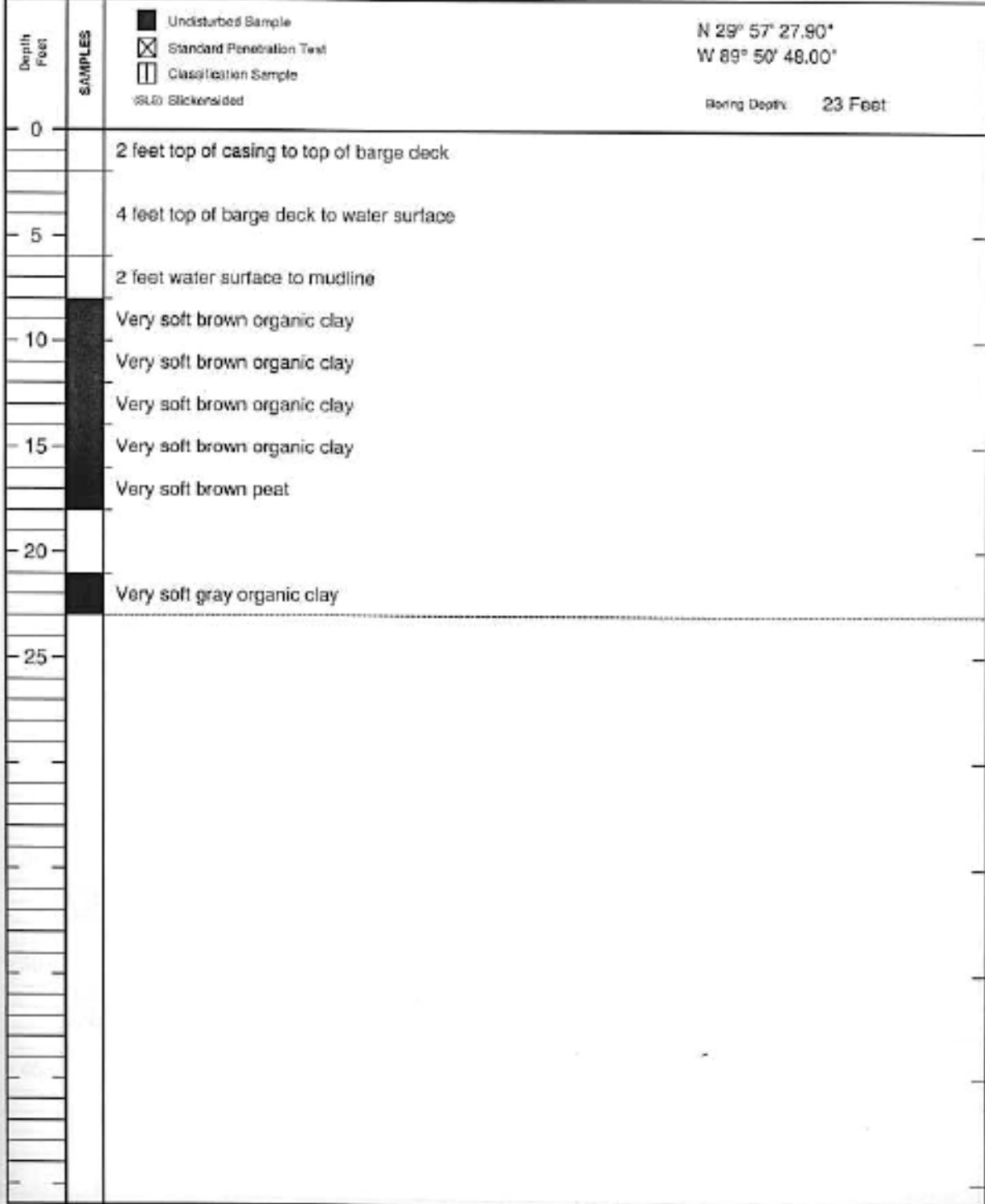
<p><u>NAD 83 Geodetic Position</u></p> <p>Lat. 29°51'17.18441"          Long. 89°40'41.00787"</p> <p><u>La. State Plane South Zone(NAD 83)</u></p> <p>N= 496,469.38          E= 3,805,525.51</p> <p><u>NAVD 88(Feet)/Geoid 99</u></p> <p>Elevation= 1.54feet/0.469meters</p> <p>Ellipsoid Height = -25.400 meters          Geoid99 Height = -25.868 meters</p>
--



**APPENDIX F: SOIL BORING LOGS**

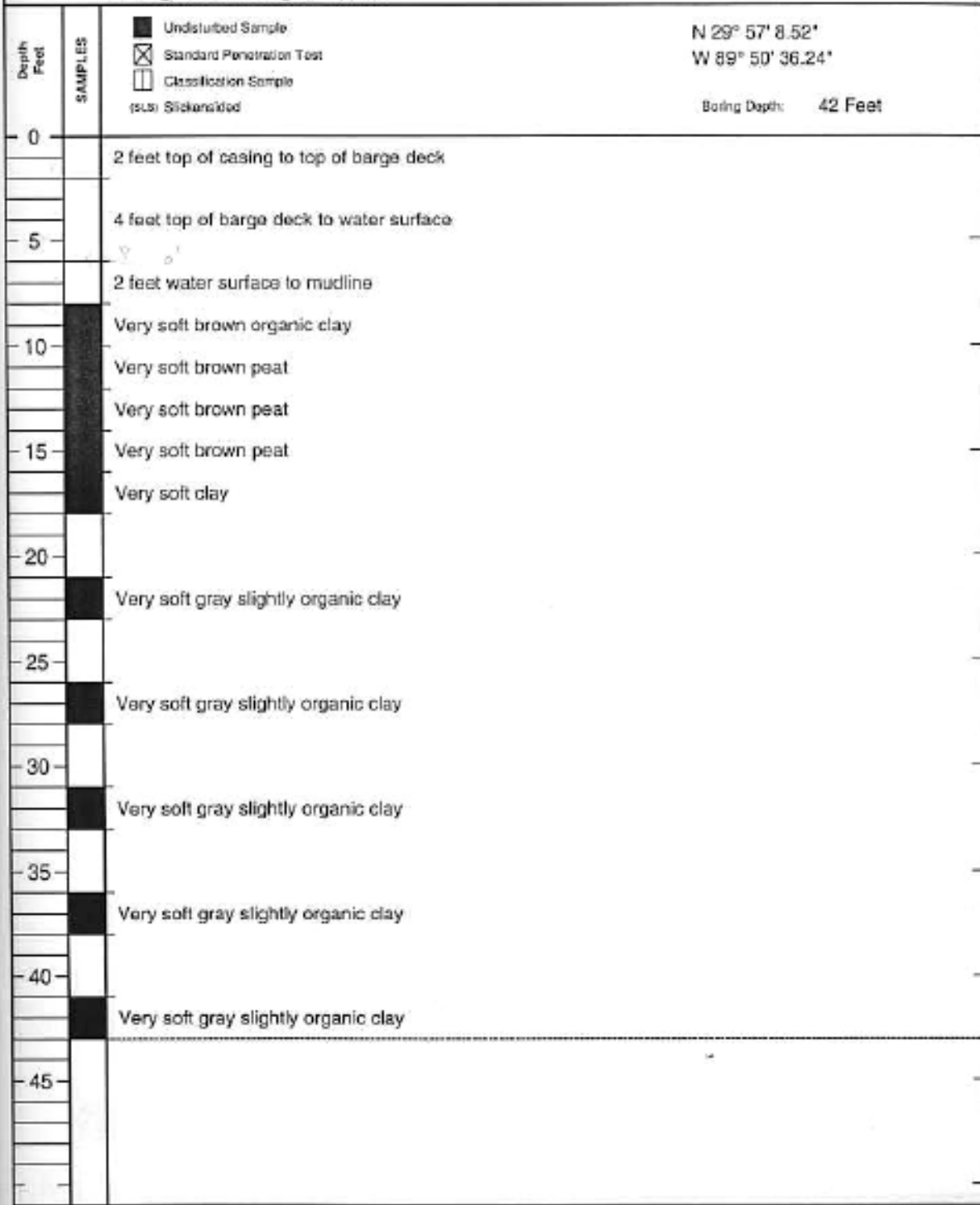
### LOG OF BORING

<b>Project:</b> Shoreline Protection/Marsh Creation at Lake Borgne DNR Contract No. 2503-03-15 PO-30 <b>For:</b> State of Louisiana, Department of Natural Resources c/o Sigma Consulting Group, Inc.	<b>Boring:</b> 1 <b>File:</b> 02-115 <b>Date:</b> 12-Nov-02 <b>Technician:</b> JH
--	--



### LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne	Boring: 2
DNR Contract No. 2503-03-15 PO-30	File: 02-115
For: State of Louisiana, Department of Natural Resources	Date: 12-Nov-02
c/o Sigma Consulting Group, Inc.	Technician: JH



LOUISIANA CONSULTING ASSOCIATES, INC.

### LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne DNR Contract No. 2503-03-15 PO-30 For: State of Louisiana, Department of Natural Resources c/o Sigma Consulting Group, Inc.		Boring: 3 File: 02-115 Date: 13-Nov-02 Technician: JH
Depth Feet	SAMPLES	<div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: black; margin-right: 5px;"></span> Undisturbed Sample</li> <li><span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Standard Penetration Test</li> <li><span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Classification Sample</li> <li>(SLS) Slickensided</li> </ul> </div> <div style="width: 50%;"> <p>N 29° 56' 38.10"</p> <p>W 89° 50' 20.22"</p> <p>Boring Depth: 73 Feet</p> </div> </div>
0		2 feet top of casing to top of barge deck
5		6 feet top of barge deck to water surface
10		
15		15 feet water surface to mudline
20		
25		Very soft brown organic clay
26		Very soft gray slightly organic clay
27		Very soft gray clay
30		Very soft gray silty clay with 2 inch fine sand layer
31		Firm gray clayey sand with organic matter traces
35		Very soft gray slightly organic clay
40		Very soft gray silty clay
45		Soft gray clay
50		

(SLS)



## LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne  
 DNR Contract No. 2503-03-15 PO-30  
 For: State of Louisiana, Department of Natural Resources  
 c/o Sigma Consulting Group, Inc.

Boring: 3  
 File: 02-115  
 Date: 13-Nov-02  
 Technician: JH

Depth Feet	SAMPLES		
	<ul style="list-style-type: none"> <li><span style="display: inline-block; width: 10px; height: 10px; background-color: black; margin-right: 5px;"></span> Undisturbed Sample</li> <li><span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; border-style: dashed; margin-right: 5px;"></span> Standard Penetration Test</li> <li><span style="display: inline-block; width: 10px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Classification Sample</li> </ul> (S&S) Slickensided		Boring Depth: 73 Feet
50	■	Soft gray slightly organic clay	
55	■	Soft gray slightly organic clay	
60	⊗	Firm gray fine sand with silt traces	18 blows per foot (8/8/10)
65		Alternating layers of clay and fine sand	
70	■	Firm gray clayey sand with shells	
75	⊗	Dense gray clayey fine sand	34 blows per foot (10/17/17)
80			
85			
90			
95			
100			
105			
110			
115			
120			
125			
130			
135			
140			
145			
150			
155			
160			
165			
170			
175			
180			
185			
190			
195			
200			

**LOUIS J. CAPOZZOLI & ASSOCIATES. INC.**

## LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne DNR Contract No. 2503-03-15 PO-30 For: State of Louisiana, Department of Natural Resources c/o Sigma Consulting Group, Inc.		Boring: 4 File: 02-115 Date: 13-Nov-02 Technician: JH
Depth Feet	SAMPLES	<div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: black; margin-right: 5px;"></span> Undisturbed Sample</li> <li><span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Standard Penetration Test</li> <li><span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Classification Sample</li> </ul> <p style="font-size: small; margin-top: 5px;">(SL) Skipped</p> </div> <div style="width: 55%;"> <p>N 29° 56' 28.02"</p> <p>W 89° 49' 58.02"</p> <p style="text-align: right;">Boring Depth: 43 Feet</p> </div> </div>
0		2 feet top of casing to top of barge deck
5		4 feet top of barge deck to water surface
		2 feet water surface to mudline
-10		Very soft brown slightly organic clay
		Very soft brown peat
		Very soft brown peat
-15		Very soft brown peat
		Very soft gray organic clay
-20		Very soft gray clay with sand traces
-25	X	Firm gray silty fine sand
		12 blows per foot (5/6/6)
-30		Firm gray silty fine sand
-35	X	Loose gray silty fine sand
		6 blows per foot (2/2/4)
-40	X	Loose gray clayey fine sand
		9 blows per foot (2/4/5)

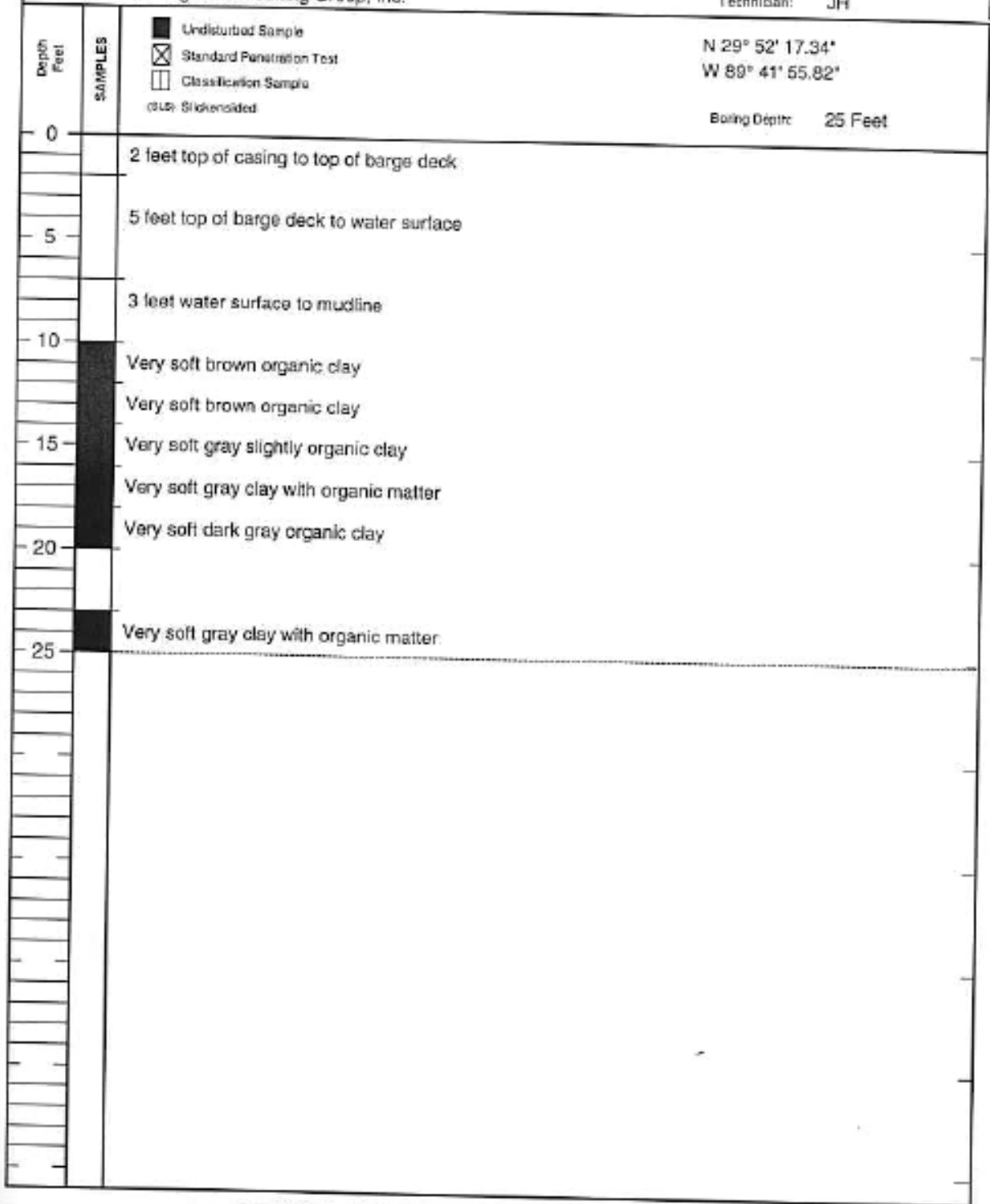
### LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne DNR Contract No. 2503-03-15 PO-30 For: State of Louisiana, Department of Natural Resources c/o Sigma Consulting Group, Inc.		Boring: 5 File: 02-115 Date: 14-Nov-02 Technician: JH
Depth Feet	SAMPLES	<div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: black; margin-right: 5px;"></span> Undisturbed Sample</li> <li><span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Standard Penetration Test</li> <li><span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Classification Sample</li> <li>(SL) Slickensided</li> </ul> </div> <div style="width: 55%;"> <p style="margin: 0;">N 29° 56' 15.36"</p> <p style="margin: 0;">W 89° 49' 37.92"</p> <p style="margin: 0;">Boring Depth: 24 Feet</p> </div> </div>
0		2 feet top of casing to top of barge deck
5		4 feet top of barge deck to water surface
		3 feet water surface to mudline
10		Very soft brown slightly organic clay
		Very soft brown organic clay
15		Very soft gray slightly organic clay
		Firm gray silty fine sand with clay streaks
20		
	X	Loose gray silty fine sand
25		7 blows per foot (3/3/4)

### LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne  
 DNR Contract No. 2503-03-15 PO-30  
 For: State of Louisiana, Department of Natural Resources  
 c/o Sigma Consulting Group, Inc.

Boring: 6  
 File: 02-115  
 Date: 12-Nov-02  
 Technician: JH



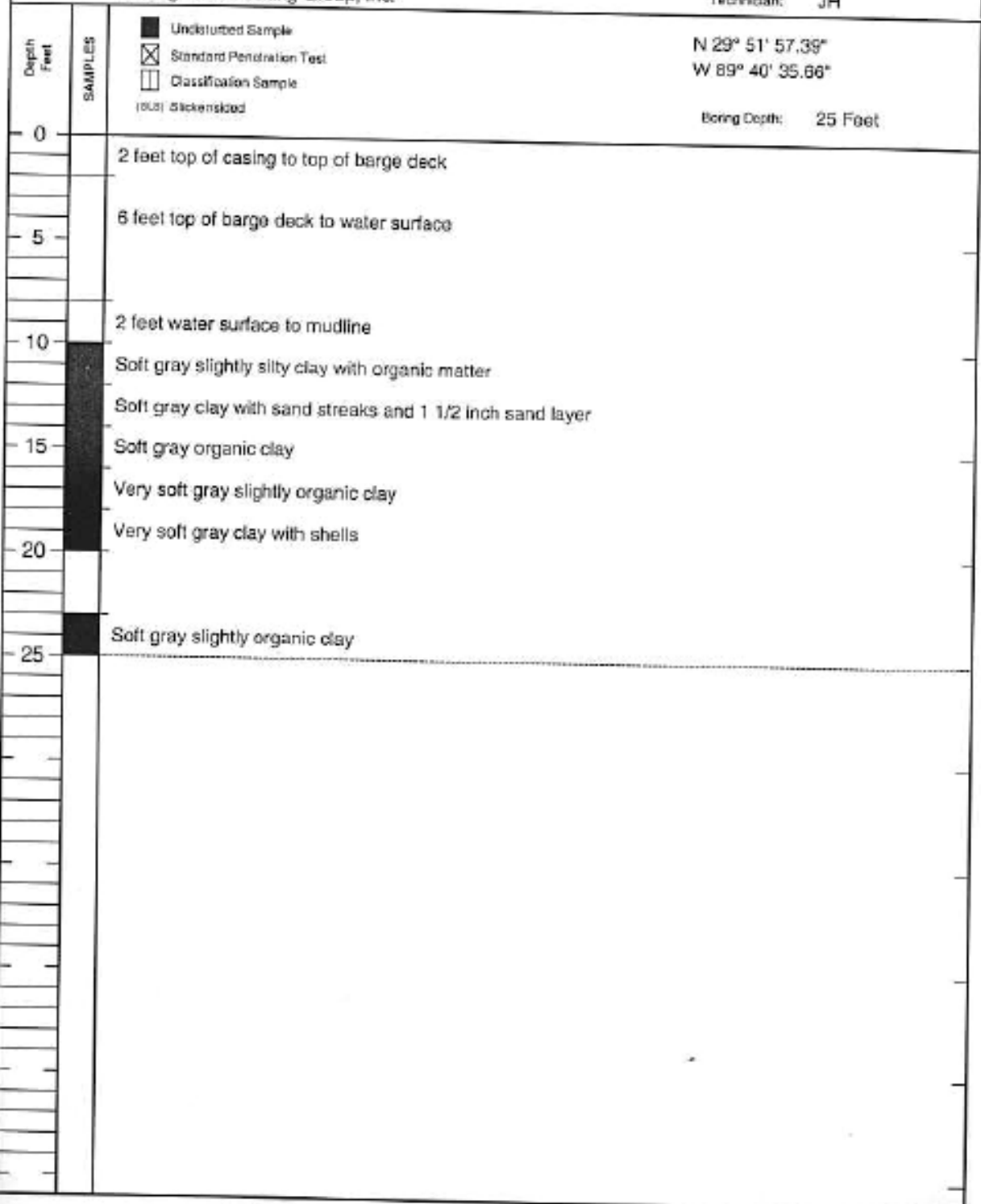
### LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne DNR Contract No. 2503-03-15 PO-30 For: State of Louisiana, Department of Natural Resources c/o Sigma Consulting Group, Inc.		Boring: 7 File: 02-115 Date: 12-Nov-02 Technician: JH
Depth Feet	SAMPLES	<div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: black; margin-right: 5px;"></span> Undisturbed Sample</li> <li><span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Standard Penetration Test</li> <li><span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Classification Sample</li> </ul> <p style="font-size: small; margin: 0;">(R-A) Stickensided</p> </div> <div style="width: 50%;"> <p style="margin: 0;">N 29° 51' 59.20"</p> <p style="margin: 0;">W 89° 40' 54.87"</p> <p style="margin: 0;">Boring Depth: 45 Feet</p> </div> </div>
0		2 feet top of casing to top of barge deck
5		5 feet top of barge deck to water surface
10		3 feet water surface to mudline
10		Very soft brown organic clay
10		Very soft brown organic clay
15		Very soft brown peat
15		Very soft brown organic clay
15		Very soft brown peat
20		Very soft brown peat
25		Very soft brown organic clay
30		Very soft brown organic clay
35		Very soft gray slightly organic clay with sand lenses and sand streaks
40		Very soft brown peat
45		Very soft gray slightly organic clay

## LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne  
 DNR Contract No. 2503-03-15 PO-30  
 For: State of Louisiana, Department of Natural Resources  
 c/o Sigma Consulting Group, Inc.

Boring: 8  
 File: 02-115  
 Date: 12-Nov-02  
 Technician: JH



### LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne DNR Contract No. 2503-03-15 PO-30 For: State of Louisiana, Department of Natural Resources c/o Sigma Consulting Group, Inc.		Boring: 9 File: 02-115 Date: 14-Nov-02 Technician: JH																																						
Depth Feet	SAMPLES	■ Undisturbed Sample ☒ Standard Penetration Test □ Classification Sample (SLU) Slickensided	N 29° 52' 01.42" W 89° 40' 17.46"  Boring Depth: 47 Feet																																					
		<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 5%; text-align: center;">0</td> <td style="width: 15%;"></td> <td>2 feet top of casing to top of barge deck</td> </tr> <tr> <td style="text-align: center;">5</td> <td></td> <td>4 feet top of barge deck to water surface</td> </tr> <tr> <td style="text-align: center;">10</td> <td></td> <td>6 feet water surface to mudline</td> </tr> <tr> <td style="text-align: center;">15</td> <td style="background-color: black;"></td> <td>Very soft gray clay with organic matter and shells</td> </tr> <tr> <td style="text-align: center;">20</td> <td style="background-color: black;"></td> <td>Soft gray slightly sandy clay with sand streaks, organic matter, and shells</td> </tr> <tr> <td style="text-align: center;">25</td> <td style="background-color: black;"></td> <td>Very soft gray clay with organic matter</td> </tr> <tr> <td style="text-align: center;">30</td> <td style="background-color: black;"></td> <td>Very soft gray clay with 2 inch fine sand layer</td> </tr> <tr> <td style="text-align: center;">35</td> <td style="background-color: black;"></td> <td>Firm gray fine sand</td> </tr> <tr> <td style="text-align: center;">40</td> <td style="background-color: black;"></td> <td>Soft gray clay with 3 inch organic clay layer</td> </tr> <tr> <td style="text-align: center;">45</td> <td style="background-color: black;"></td> <td>Soft gray slightly organic clay</td> </tr> <tr> <td style="text-align: center;">50</td> <td style="background-color: black;"></td> <td>Soft gray slightly silty clay with 3 inch fine sand layer, organic matter, and shells</td> </tr> <tr> <td style="text-align: center;">55</td> <td style="background-color: black;"></td> <td>Soft gray clay with silt lenses</td> </tr> <tr> <td style="text-align: center;">60</td> <td style="background-color: black;"></td> <td>Soft gray clay with silt lenses</td> </tr> </table>		0		2 feet top of casing to top of barge deck	5		4 feet top of barge deck to water surface	10		6 feet water surface to mudline	15		Very soft gray clay with organic matter and shells	20		Soft gray slightly sandy clay with sand streaks, organic matter, and shells	25		Very soft gray clay with organic matter	30		Very soft gray clay with 2 inch fine sand layer	35		Firm gray fine sand	40		Soft gray clay with 3 inch organic clay layer	45		Soft gray slightly organic clay	50		Soft gray slightly silty clay with 3 inch fine sand layer, organic matter, and shells	55		Soft gray clay with silt lenses	60
0		2 feet top of casing to top of barge deck																																						
5		4 feet top of barge deck to water surface																																						
10		6 feet water surface to mudline																																						
15		Very soft gray clay with organic matter and shells																																						
20		Soft gray slightly sandy clay with sand streaks, organic matter, and shells																																						
25		Very soft gray clay with organic matter																																						
30		Very soft gray clay with 2 inch fine sand layer																																						
35		Firm gray fine sand																																						
40		Soft gray clay with 3 inch organic clay layer																																						
45		Soft gray slightly organic clay																																						
50		Soft gray slightly silty clay with 3 inch fine sand layer, organic matter, and shells																																						
55		Soft gray clay with silt lenses																																						
60		Soft gray clay with silt lenses																																						

## LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne  
 DNR Contract No. 2503-03-15 PO-30  
 For: State of Louisiana, Department of Natural Resources  
 c/o Sigma Consulting Group, Inc.

Boring: 10  
 File: 02-115  
 Date: 11-Nov-02  
 Technician: JH

N 29° 51' 50.63"  
 W 89° 39' 49.78"

Boring Depth: 22 Feet

Depth Feet	SAMPLES	<input type="checkbox"/> Undisturbed Sample <input checked="" type="checkbox"/> Standard Penetration Test <input type="checkbox"/> Classification Sample (P.S.) Slickensided		
0			2 feet top of casing to top of barge deck	
5			4 feet top of barge deck to water surface	
			2 feet water surface to mudline	
10		<input checked="" type="checkbox"/>	Very soft gray slightly organic clay	
		<input checked="" type="checkbox"/>	Very loose gray shells with sand traces	2 blows per foot (1/1/1)
		<input checked="" type="checkbox"/>	Very loose gray sand with shells and silt traces	2 blows per foot (1/1/1)
15		<input checked="" type="checkbox"/>	Loose gray shells and sand with silt traces	3 blows per foot (1/2/1)
		<input checked="" type="checkbox"/>	Loose gray shells with sand traces	4 blows per foot (1/2/2)
20				
		<input checked="" type="checkbox"/>	Loose gray clayey sand with organic matter	9 blows per foot (6/4/5)
25				





## LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne DNR Contract No. 2503-03-15 PO-30 For: State of Louisiana, Department of Natural Resources c/o Sigma Consulting Group, Inc.		Boring: 12 File: 02-115 Date: 14-Nov-02 Technician: JH
Depth Feet	SAMPLES	<div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: black; margin-right: 5px;"></span> Undisturbed Sample</li> <li><span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; border-style: dashed; margin-right: 5px;"></span> Standard Penetration Test</li> <li><span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Classification Sample</li> <li>(SLS) Slickensided</li> </ul> </div> <div style="width: 40%;">                 N 29° 56' 9.78"                  W 89° 49' 27.06"                  Boring Depth: 45 Feet             </div> </div>
0		2 feet top of casing to top of barge deck
5		6 feet top of barge deck to water surface
10		2 feet water surface to mudline Soft gray clay with shells Medium gray clay
15		Soft gray clay with silt streaks (SLS) Soft tan silty clay Soft gray clay
20		
25	X	Very loose gray clayey fine sand 2 blows per foot (2/1/1)
30	X	Loose gray clayey fine sand 5 blows per foot (2/2/3)
35	X	Firm gray clayey fine sand 14 blows per foot (10/5/9)
40	X	Firm gray clayey fine sand 28 blows per foot (12/13/15)
45	X	Very dense gray silty fine sand with clay traces 69 blows per foot (27/30/39)

LOUIS L. CAROZZI & ASSOCIATES, INC.

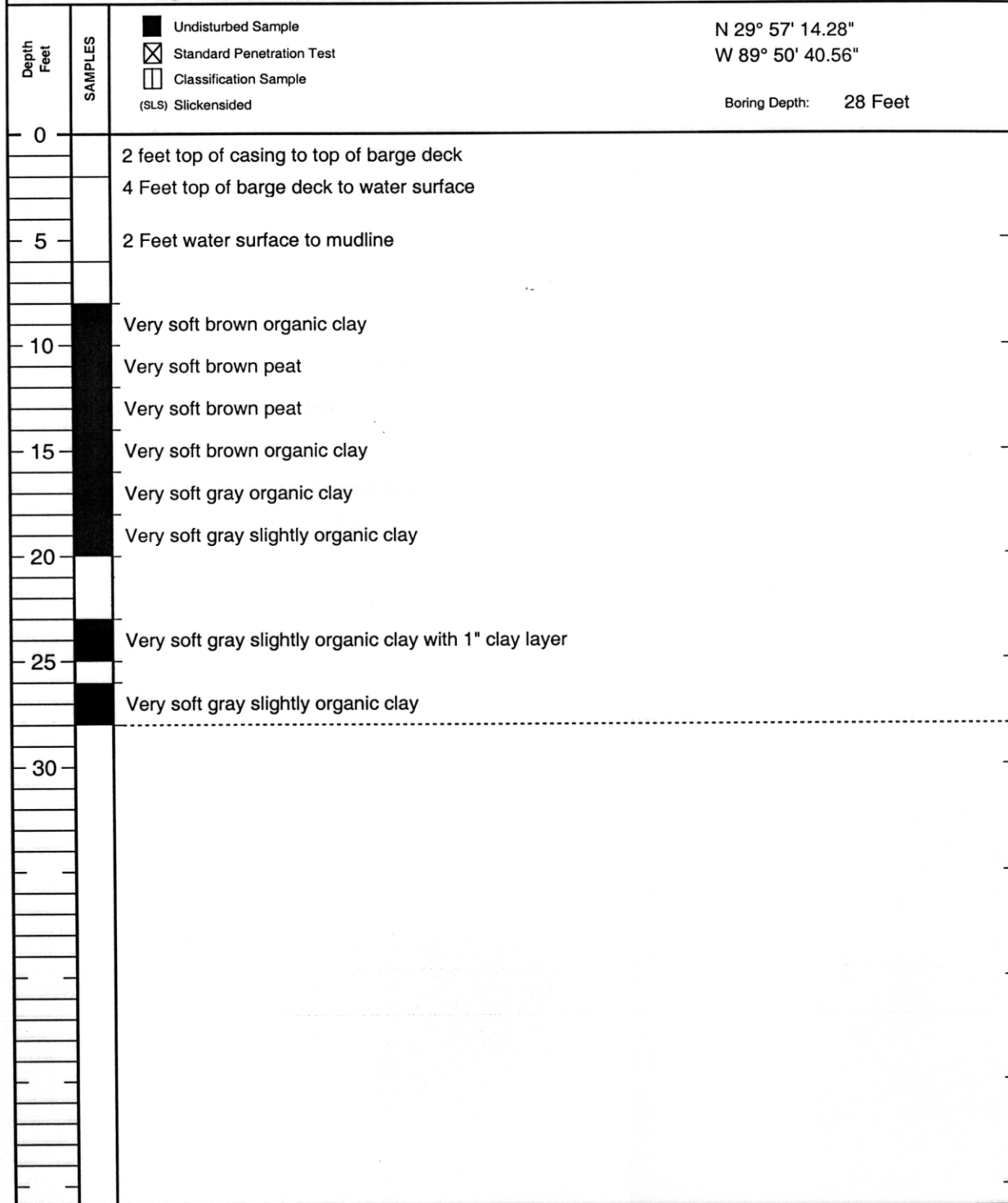
## LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne DNR Contract No. 2503-03-15 PO-30 For: State of Louisiana, Department of Natural Resources c/o Sigma Consulting Group, Inc.		Boring: 13 File: 02-115 Date: 17-Feb-03 Technician: BT
Depth Feet	SAMPLES	<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <ul style="list-style-type: none"> <li><input type="checkbox"/> Undisturbed Sample</li> <li><input checked="" type="checkbox"/> Standard Penetration Test</li> <li><input type="checkbox"/> Classification Sample</li> <li>(SLS) Slickensided</li> </ul> </div> <div style="width: 35%;"> <p>N 29° 57' 7.91"</p> <p>W 89° 50' 43.74"</p> <p>Boring Depth: 28 Feet</p> </div> </div>
0		2 feet top of casing to top of barge deck
5		4 feet top of barge deck to water surface
10		2 feet water surface to mudline Very soft dark brown organic clay Very soft dark brown organic clay Very soft dark brown peat
15		Very soft brown peat Very soft gray organic clay
20		Very soft gray slightly organic clay
25		Very soft gray clay with organic matter traces
30		Very soft gray slightly organic clay

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### LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne	Boring: 14
DNR Contract No. 2503-03-15 PO-30	File: 02-115
For: State of Louisiana, Department of Natural Resources	Date: 17-Feb-03
c/o Sigma Consulting Group, Inc.	Technician: BT



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Geotechnical Engineers

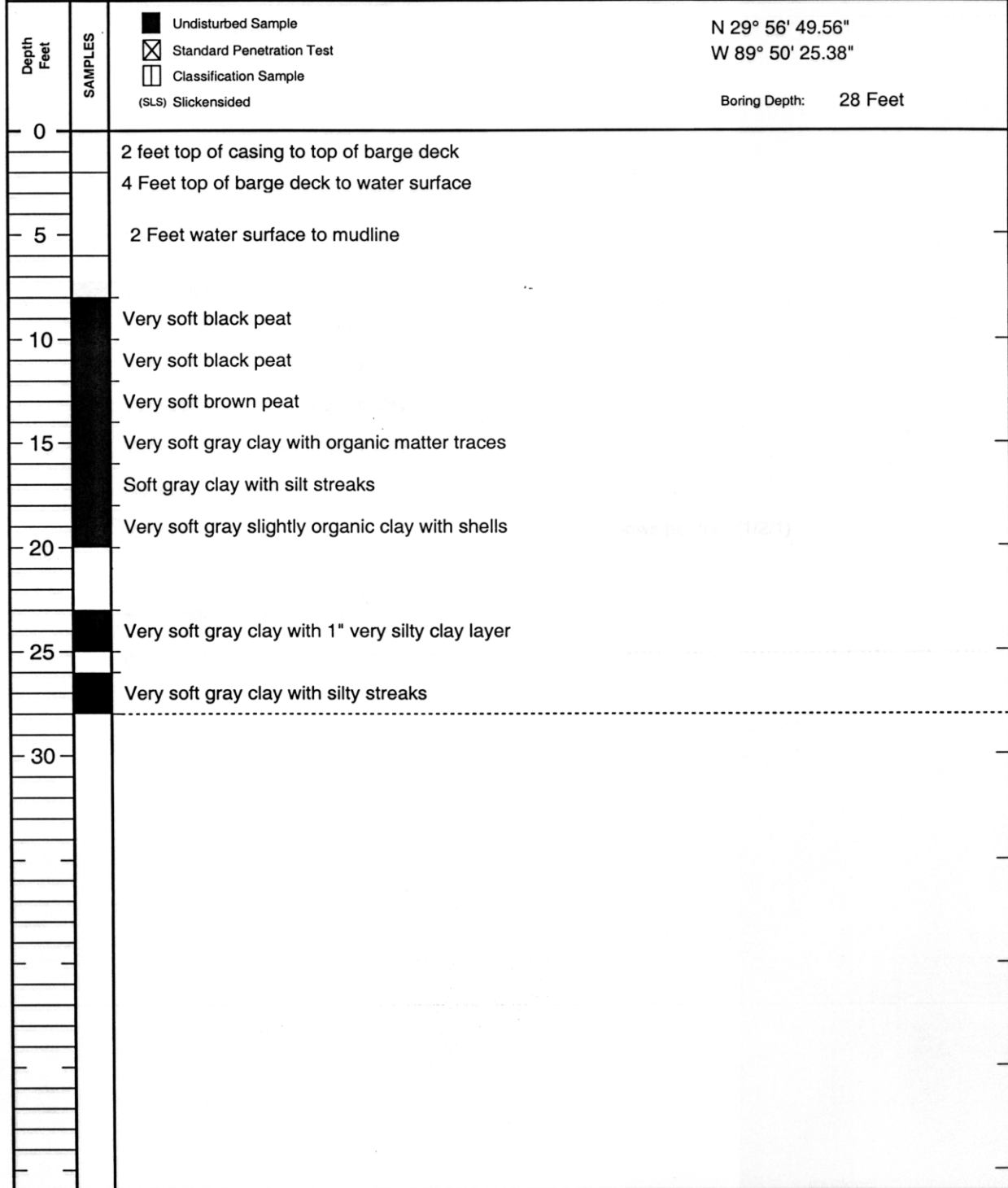
## LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne DNR Contract No. 2503-03-15 PO-30 For: State of Louisiana, Department of Natural Resources c/o Sigma Consulting Group, Inc.		Boring: 15 File: 02-115 Date: 17-Feb-03 Technician: BT
Depth Feet	SAMPLES	<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <ul style="list-style-type: none"> <li><span style="display: inline-block; width: 15px; height: 10px; background-color: black; margin-right: 5px;"></span> Undisturbed Sample</li> <li><span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Standard Penetration Test</li> <li><span style="display: inline-block; width: 15px; height: 10px; border: 1px solid black; margin-right: 5px;"></span> Classification Sample (SLS) Slickensided</li> </ul> </div> <div style="width: 35%;"> <p>N 29° 56' 59.34"</p> <p>W 89° 50' 30.72"</p> <p>Boring Depth: 28 Feet</p> </div> </div>
0		2 feet top of casing to top of barge deck 4 Feet top of barge deck to water surface
5		2 Feet water surface to mudline
10		Very soft dark brown peat
		Very soft dark brown organic clay
		Very soft dark brown peat
15		Soft gray silty clay
		Very soft gray slightly organic clay
		Very soft gray slightly organic clay
20		Very soft gray slightly organic clay
		Very soft gray slightly organic clay
25		Very soft gray slightly organic clay
		Very soft gray slightly organic clay
30		

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Geotechnical Engineers

## LOG OF BORING

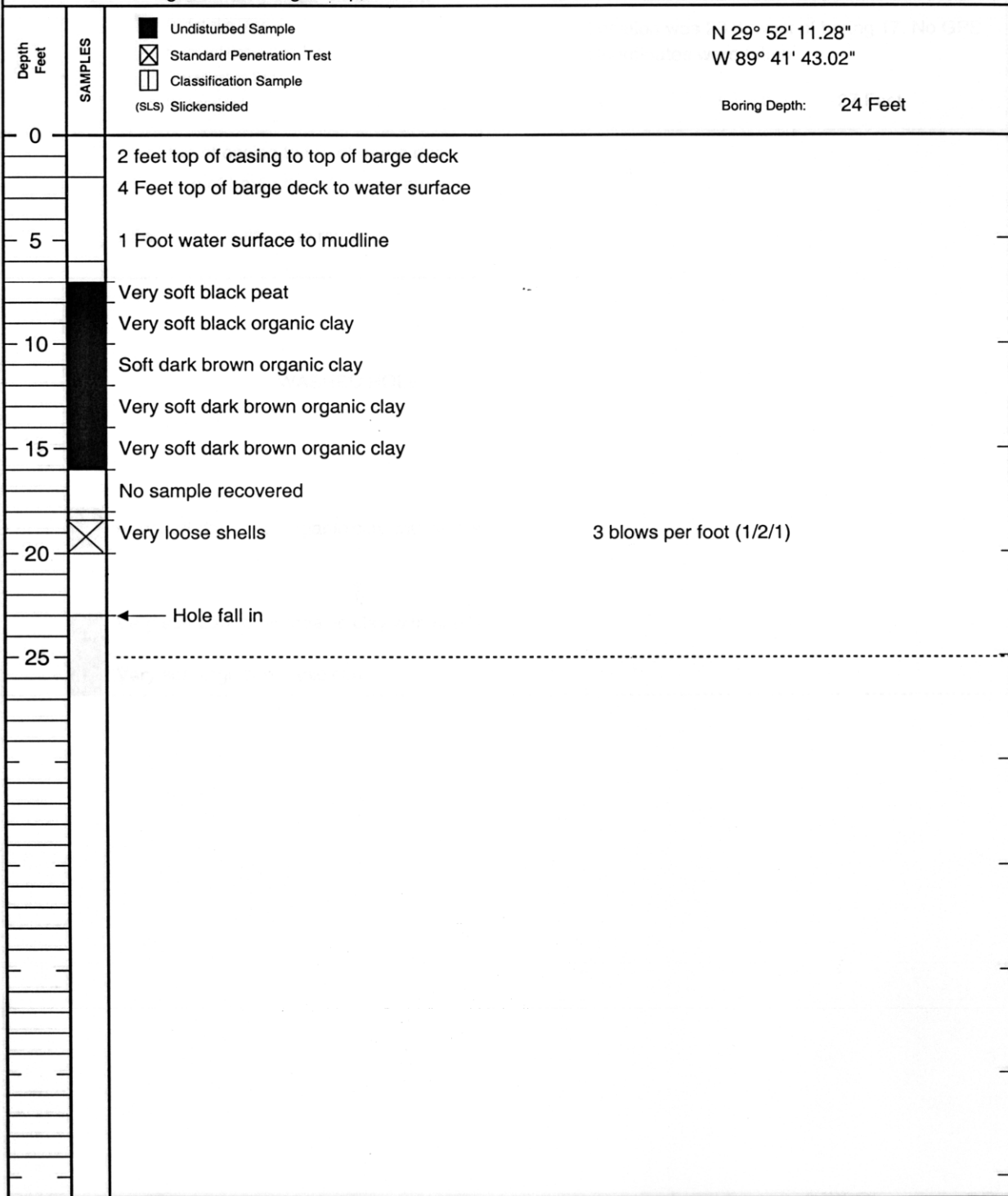
Project: Shoreline Protection/Marsh Creation at Lake Borgne	Boring: 16
DNR Contract No. 2503-03-15 PO-30	File: 02-115
For: State of Louisiana, Department of Natural Resources	Date: 17-Feb-03
c/o Sigma Consulting Group, Inc.	Technician: BT



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Geotechnical Engineers

### LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne	Boring: 17
DNR Contract No. 2503-03-15 PO-30	File: 02-115
For: State of Louisiana, Department of Natural Resources	Date: 18-Feb-03
c/o Sigma Consulting Group, Inc.	Technician: BT



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Geotechnical Engineers

## LOG OF BORING

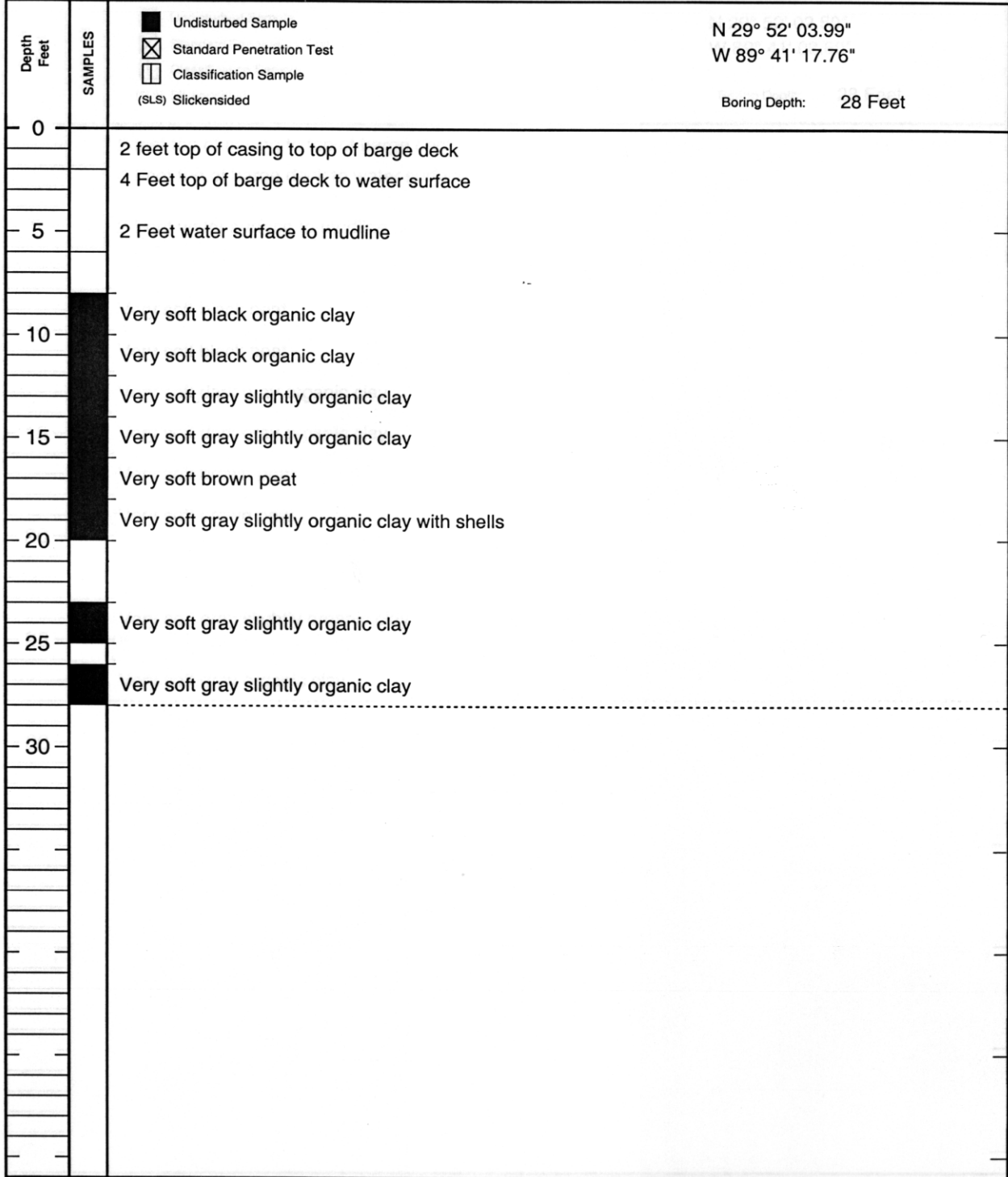
Project: Shoreline Protection/Marsh Creation at Lake Borgne DNR Contract No. 2503-03-15 PO-30 For: State of Louisiana, Department of Natural Resources c/o Sigma Consulting Group, Inc.		Boring: 17A File: 02-115 Date: 18-Feb-03 Technician: BT								
Depth Feet	SAMPLES	<table style="width: 100%; border: none;"> <tr> <td style="width: 15px;"><input type="checkbox"/></td> <td>Undisturbed Sample</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Standard Penetration Test</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Classification Sample</td> </tr> <tr> <td></td> <td>(SLS) Slickensided</td> </tr> </table>	<input type="checkbox"/>	Undisturbed Sample	<input checked="" type="checkbox"/>	Standard Penetration Test	<input type="checkbox"/>	Classification Sample		(SLS) Slickensided
<input type="checkbox"/>	Undisturbed Sample									
<input checked="" type="checkbox"/>	Standard Penetration Test									
<input type="checkbox"/>	Classification Sample									
	(SLS) Slickensided									
		Location was 20 ft. west of boring 17. No GPS Coordinates were taken.  Boring Depth: 27 Feet								
0		2 feet top of casing to top of barge deck 4 Feet top of barge deck to water surface								
5		1 Foot water surface to mudline								
10		WASHED HOLE								
15										
20	■	Very soft dark gray organic clay with shells								
25	■	Very soft dark gray organic clay with shells Very soft slightly organic clay								
30										
35										
40										
45										
50										
55										
60										
65										
70										
75										
80										
85										
90										
95										
100										

**LOUIS J. CAPOZZOLI & ASSOCIATES, INC.**  
 Geotechnical Engineers



## LOG OF BORING

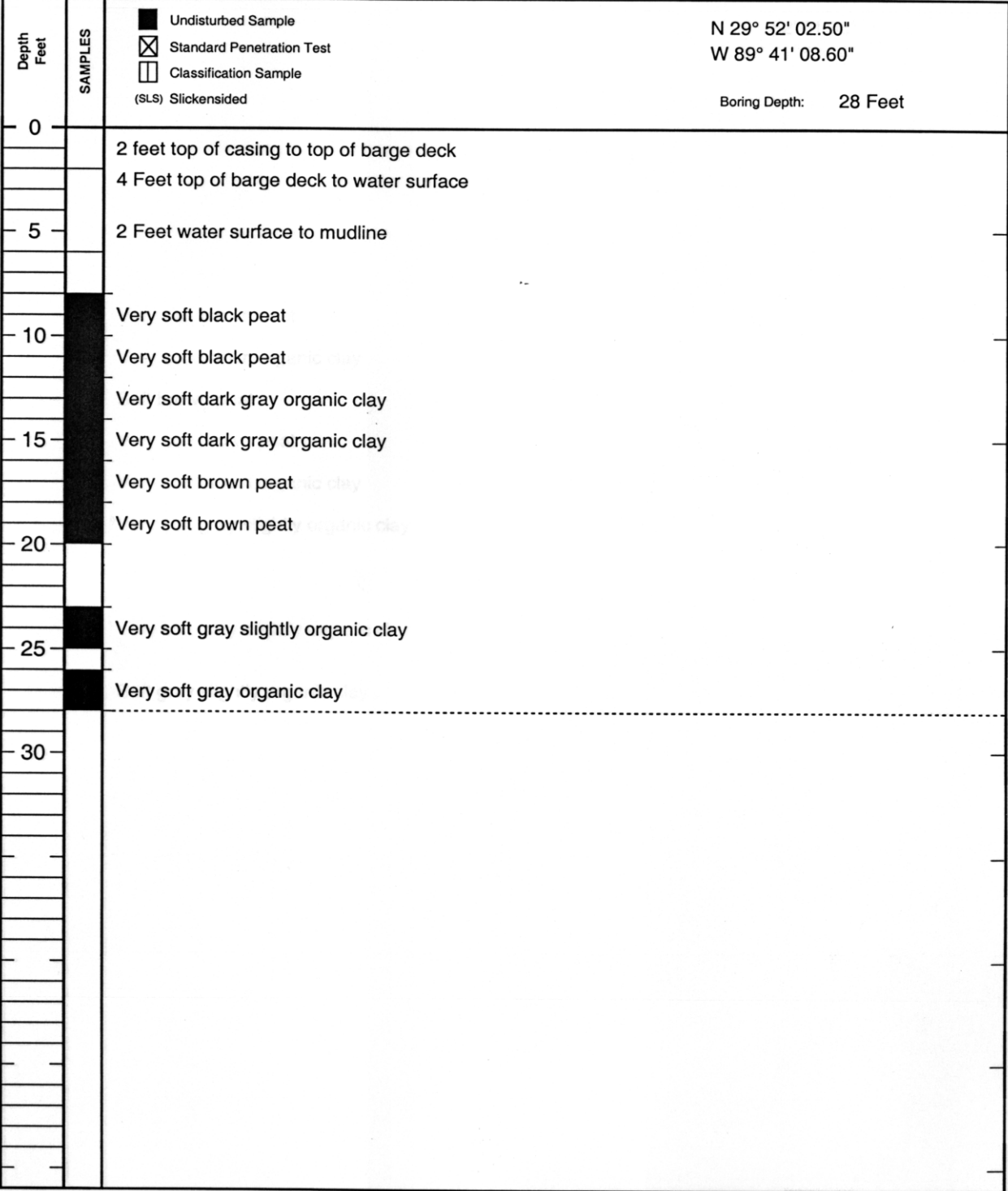
Project: Shoreline Protection/Marsh Creation at Lake Borgne	Boring: 18
DNR Contract No. 2503-03-15 PO-30	File: 02-115
For: State of Louisiana, Department of Natural Resources	Date: 18-Feb-03
c/o Sigma Consulting Group, Inc.	Technician: BT



**LOUIS J. CAPOZZOLI & ASSOCIATES, INC.**  
Geotechnical Engineers

## LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne DNR Contract No. 2503-03-15 PO-30 For: State of Louisiana, Department of Natural Resources c/o Sigma Consulting Group, Inc.	Boring: 19 File: 02-115 Date: 18-Feb-03 Technician: BT
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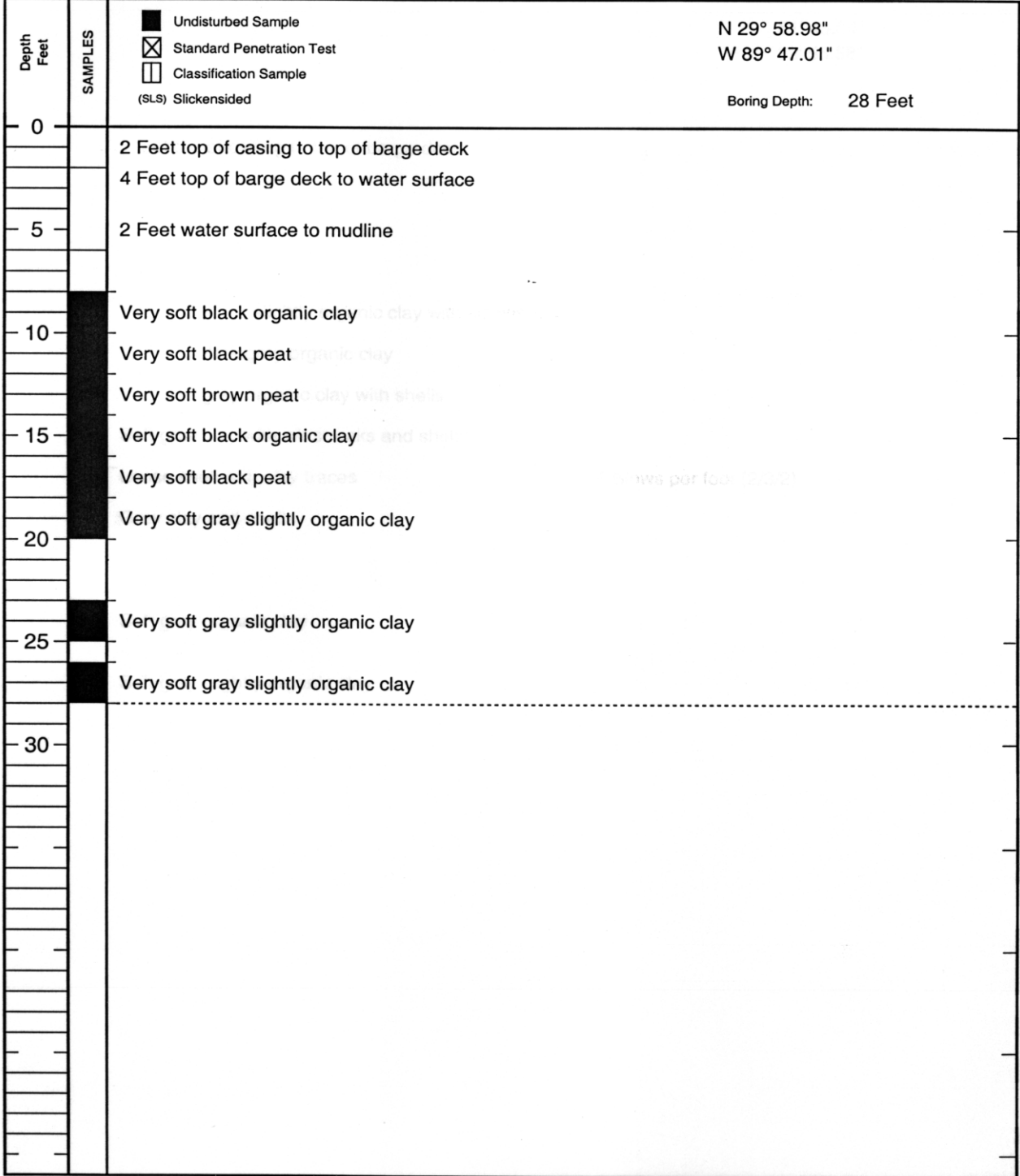


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## LOG OF BORING

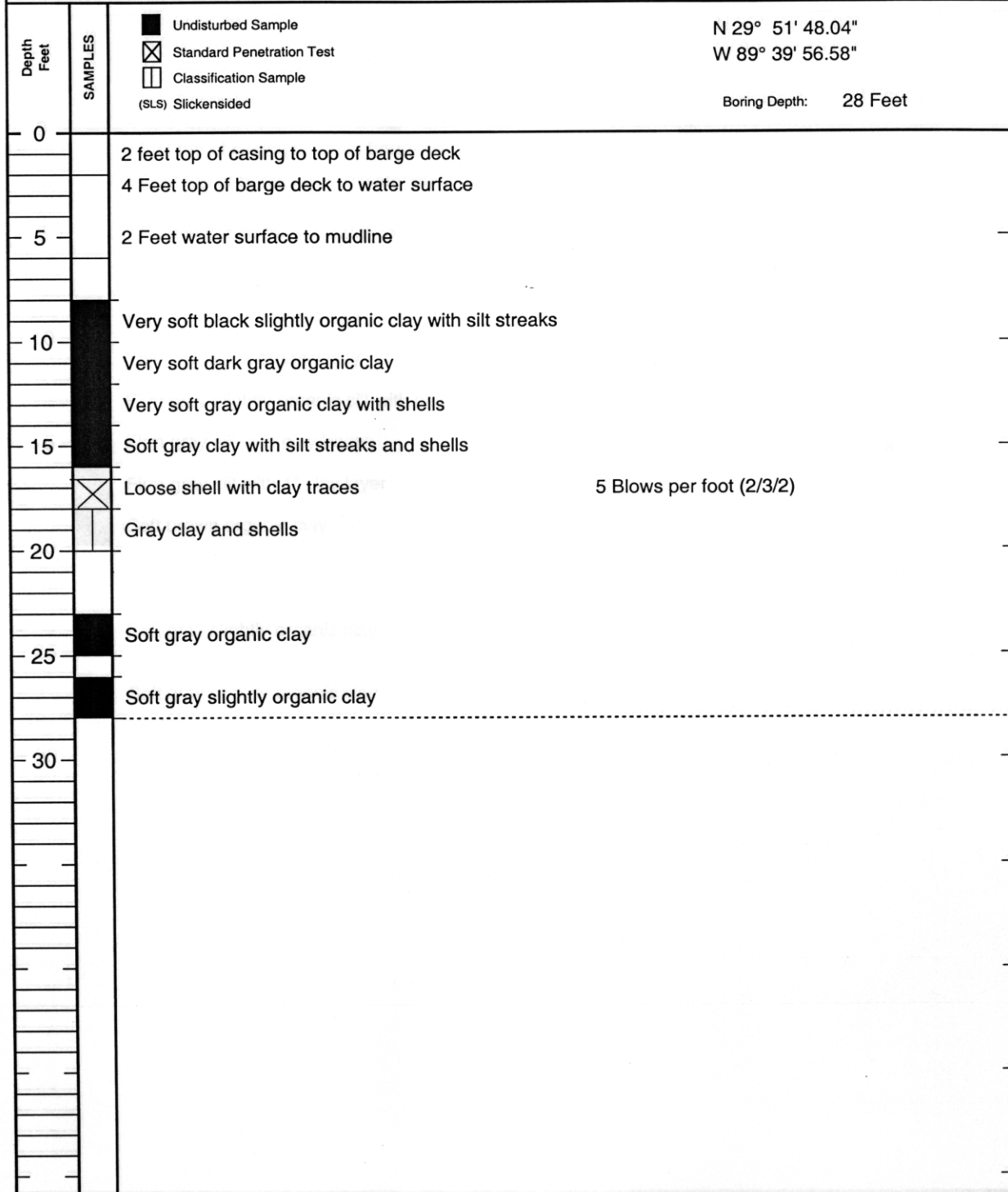
Project: Shoreline Protection/Marsh Creation at Lake Borgne	Boring: 21
DNR Contract No. 2503-03-15 PO-30	File: 02-115
For: State of Louisiana, Department of Natural Resources	Date: 18-Feb-03
c/o Sigma Consulting Group, Inc.	Technician: BT



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## LOG OF BORING

Project: Shoreline Protection/Marsh Creation at Lake Borgne	Boring: 22
DNR Contract No. 2503-03-15 PO-30	File: 02-115
For: State of Louisiana, Department of Natural Resources	Date: 19-Feb-03
c/o Sigma Consulting Group, Inc.	Technician: BT



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