ATTACHMENT III

BARATARIA LAND BRIDGE SHORELINE PROTECTION PROJECT

PROJECT COMPLETION REPORT

NRCS Natural Resources Conservation Service
United States Department of Agriculture

Natural Resources Conservation Service

3737 Government Street
Alexandria, Louisiana
71302

November 26, 2001

Mr. George Boddie
Project Manager
Coastal Restoration Division
Department of Natural Resources
P.O. Box 94396
Baton Rouge, LA 70804-9396

Mr. Tom Podany
Chief, CWPPRA Program Manager
US Army Engineer District, New Orleans
P.O. Box 60267
New Orleans, Louisiana 70506

Gentlemen:

Re: PL-646 – BA-27
Barataria Land Bridge Shoreline Protection (Test Sections) Construction Unit #1

The referenced project has been completed. Enclosed is a Project Completion Report for the project. Also included with the completion report is a "Constructability Evaluation" with associated data of the various test sections constructed. A copy of the "As Built" plans will be forwarded upon completion of the drafting.

Please direct any questions concerning this Project Completion Report to Brad Sticker at (318) 473-7791.

Sincerely,

/s/
Ed Giering, P.E.
State Conservation Engineer

Enclosure

cc: Bruce Lehto, ASTC/Water Resources, NRCS, Alexandria, LA (electronic distribution)
Britt Paul, Water Resources Planning Staff Leader, NRCS, Alexandria, LA (electronic distribution)
Dr. Bill Good, LDNR – CRD, Baton Rouge, LA (electronic distribution)
Quin Kinler, Project Manager, NRCS, Baton Rouge, LA (electronic distribution)
Brad Sticker, Civil Engineer, NRCS, Alexandria, LA (electronic distribution)
Charles Phillips, Contracting Officer, NRCS, Alexandria, LA (electronic distribution)
Dale Garber, COTR, NRCS, Crowley, LA (electronic distribution)
Melvin Rodrigue, Inspector, NRCS, Crowley, LA (electronic distribution)
Cherie LaFleur, Design Engineer, NRCS, Alexandria, LA (electronic distribution)
Ronnie Faulkner, Design Engineer, NRCS, Alexandria, LA (electronic distribution)

PROJECT COMPLETION REPORT[1]

PROJECT NAME	**BARATARIA LANDBRIDGE SHORELINE PROTECTION C. U. #1 (TEST SECTIONS)**
CWPPRA/STATE PROJECT NO.	**BA-27**

Report Date: November 30, 2001 **BY:** USDA - NRCS

1. **Project Managers/Contracting Officer:**

DNR Project Manager	**George Boddie**	**Telephone**	**(504) 283-1771**
DNR Construction Project Manager	**John Hodnet**	**Telephone**	**(225) 342-7305**
DNR Monitoring Manager	**Melissa Hymel**	**Telephone**	**(504) 288-4684**
Federal Agency Project Manager	**Quin Kinler**	**Telephone**	**(225) 382-2047**
Federal Agency Contracting Officer	**Charles Phillips**	**Telephone**	**(318) 473-7796**

2. **Location and description of projects as approved for construction by Task Force.**

The Barataria Basin Land Bridge Shoreline Protection Project Phase 1 is located in both Jefferson and Lafourche Parishes, Louisiana, central to a point approximately 14 miles south of Lafitte, along the south-east bank of Bayou Rigolettes, the west bank of Bayou Perot. The entire project area encompasses approximately 4,862 acres of intermediate marsh, brackish marsh, upland shrub, and open water habitat. This project area was identified by the CWPPRA Environmental Work Group (EnvWG) and represents the acreage that, without the project over 20 years, would be lost directly to shoreline erosion, as well as additional acreage that would be affected by increased tidal exchange, coalescence of interior ponds, and deepening of interior ponds throughout the project life. This project will be completed in multiple construction contracts. **This project completion report is representative of only that portion of the work completed in Construction Unit #1.**

The objective of the Barataria Basin Land Bridge Shoreline Protection Project is to reduce or eliminate shoreline/ bank-line erosion for portions of Bayous Perot and Rigolettes in Jefferson and Lafourche Parishes. Secondary benefits would include maintenance and, in some areas, an increased extent of submerged aquatic vegetation. Construction Unit #1 includes 1600 linear feet of shoreline protection along the west bank of Bayou Perot, and 1600 linear feet of shoreline protection along the southeast bank of Bayou Rigolettes. This construction unit will be assessed to determine the construction and economic feasibility for future work within the Landbridge project. The assessment will include monitoring of the installed measures and economic analysis, and should be completed by March 2002.

The scope of this contract (Construction Unit #1) consisted of installing shoreline restoration test sections at the two locations described above. Each site consists four sections of different types of shoreline protection features, each 400 linear feet in length and spaced 50 to 75 feet apart. Segments A and A1 consisted of 200 linear feet of rock dike and 200 linear feet of rock dike placed on freshly excavated spoil, respectively. Section B consists of 400 linear feet of composite rock dike utilizing core of lightweight aggregate encapsulated in geotextile. Section C consists of 400 linear feet of composite rock dike using a furrow method to place and encapsulate the lightweight aggregate core. A COE R-400 riprap gradation placed over a geotextile fabric to an elevation of +3.0 NAVD 88 with a 3' top width and 4:1 side slopes was used for Sections A, A1, B & C. The lightweight aggregate used in Sections B & C was expanded clay, and completely encapsulated in a geotextile fabric. Section D consisted of 400 linear feet of pre-stressed concrete pile and panel wall. The piles were 16" x 16" x 80' and the panels were 20'x 6' x 6" thick.

3. **Final, as-built features, boundaries and resulting acreage (use attachments if necessary).**

On both sites, Section A & A1 were constructed to the lines and grades as shown on the plans; however these sections experienced significant settlement. At the Bayou Perot site, the Section A & A1 rock dike experienced a complete foundation failure and the rock has moved vertically approximately 14'. It was decided not to continue to place additional rock riprap on this section during the initial construction. All of the remaining composite rock dikes have experienced settlement. The concrete wall sections were constructed to the lines and grades as shown on the plans. For additional information see attached "AS BUILT" plans and monitoring survey data.

Actual Benefited Acres

4. **Key project cost elements**

	CWPPRA Project Cost Estimates**	Cost Incurred as of Construction Completion
Construction	**THIS INFORMATION WILL BE COMPLETED WHEN ALL PHASES OF THE CONSTRUCTION FOR THIS PROJECT IS COMPLETED**	
E & D		
Landrights		
Monitoring		
O & M		
Total		

** **Most recent estimate from CWPPRA Project estimates Report produced by USACOE.**

5. **Items of Work**

Item	Work	Est. Quantity	Unit	Est. Unit Price	Estimated Amount		Bid Unit Price	Final Amount	% Over or Under
	Mobilization and Demobilization	1	Job	L.S.	$ 90,000.00				0%
2	Pollution Control	1	Job	L.S.	$ 5,000.00				0%
3	Rnd. Timber Piling, 50 ft	12	EA	$800	$ 9,600.00	12	$ 1,250.00	$ 15,000.00	0%
4	Light Weight Aggregate, Encapsulated	3,640	CY	$60	$ 218,400.00	3851	$ 60.00	$ 231,060.00	6%
5	Surface Coarse Aggregate	875	Tons	$40	$ 35,000.00	904	$ 40.00	$ 36,160.00	3%
6	Rock Riprap, 400#	22,045	Tons	$38	$ 837,710.00	19082	$ 36.00	$ 686,952.00	-13%
7	Concrete Precast Prestressed Piles, 80 ft	40	EA	$1,325	$ 53,000.00	40	$ 5,400.00	$ 216,000.00	0%
8	Concrete Precast Prestressed Panels	38	EA	$1,110	$ 42,180.00	38	$ 3,000.00	$ 114,000.00	0%
9	Metal Fabrication, Warning Sign Supports	12	EA	$500	$ 6,000.00	12	$ 750.00	$ 9,000.00	0%
10	Metal Fabrication, Settlement Plates	12	EA	$900	$ 10,800.00	12	$ 1,000.00	$ 12,000.00	0%
11	Geotextile	15,100	S.Y.	$4.00	$ 60,400.00	15668	$ 5.50	$ 86,174.00	4%
12	Construction Surveying	1	Job	$5,000	$ 5,000.00	1	$ 12,000.00	$ 12,000.00	0%
13	Contractor Quality Control	1	Job	$10,000	$ 10,000.00	1	$ 10,000.00	$ 10,000.00	0%

Original Estimated Amount $ 1,383,090.00

Original Bid Amount $ 1,585,070.00

17 Days liquidated damages assessed @ $500 per day $ (8,500.00)

Final Contract Amount **$ 1,486,846.00**

6. **Construction and construction oversight**

Prime construction contractor	**Bertucci**
Subcontractor	**JAG**
Subcontractor	**——**
Original construction contract	$ 1,585,070.00
Change orders	**$0.00**
Under runs	**$ (89,724.00)**
Final construction contract	**$ 1,486,846.00**

Const. oversight contractor	**N/A**	**Const. amt.**	**$0.00**
Cons. O.S./Admin. agency	**NRCS**	**Est. amt.**	**$**

Major equipment used.

Spud barge AB-11 with Bucyrus Erie 71B
Spud barge AB-4 with Bucyrus Erie 88B
Spud barge BB-105 with 2800 Linkbelt
Spud barge KS-112 with 2800 Linkbelt
Spud barge FS-117 with 220 Komatsu Excavator
Spud barge KS-418 with 3400 Linkbelt
Spud barge RG-624 with American 7250
Deck barge TT Co.-486 with Komatsu 220
Deck barge RG-224
M.V. Julie Marie Tug
Miss Bert Tug
Melinda Morrison Tug
Various rock barges
963 Bobcat front end loader
Berming Diesel Hammer B2005

8. **Discuss construction sequences and activities, problems encountered, solutions to problems, etc.**

Contractor began by performing preconstruction surveys. Work began at Site 1 with the contractor excavating access to the site. Upon completion of the access channel for the site, the contractor began by starting work on sections A1 and A by first placing and shaping the spoil for section A1 then placing the geotextile for both sections A & A1. The contractor then began placing the rock riprap dike sections A & A1. Excavation for access was started at Site 2 during the time rock riprap was being placed at Site 1 Sections A & A1. Sections A & A1 of Site 1 began the rapid settlement (foundation failure) on 1/23/01. The contractor wanted to continue to place rock riprap on these sections; however NRCS decided it would be better to terminate the work on sections A & A1. The reason for this decision was to allow the rock to stop moving and the foundation time to consolidate prior to adding additional load. The contractor then placed the geotextile panel for Section C at Site 1 and then placed the rock on the toes to form the furrows. The contractor then placed the first (bottom) geotextile panel for Section B at Site 1 and pinned the perimeter with rock. The second geotextile panel that would encapsulate the lightweight aggregate was then placed at Section B at Site 1. The lightweight aggregate for Section B was then placed and shaped, then the geotextile fabric was folded over the aggregate and pinned with rock. Rock riprap placement over the lightweight aggregate was completed for Section B. After completing Section B, the contractor then placed the encapsulating geotextile panel at Section C (furrow) of Site 1 and then began placing the lightweight aggregate in the furrow. The geotextile was folded over the lightweight aggregate and the rock riprap was placed to complete the section.

Upon completion of Sections A, A1, B, and C at Site 1, the contractor moved to Site 2. The same sequence and processes were employed to construct Sections A, A1, B, and C at Site 2 as is described above for Site 1. It was during the placement of the rock sections at Site 2 that the contractor started the construction of the Section D (concrete wall) at Site1. The contractor used a four-leg platform on which a three-hole pile-driving template was secured. The template was constructed of "W" section steel beams with rollers in each pile hole. Three piles were driven to grade and the template was relocated and the process repeated. Upon driving three piles, the contractor would place the panels in position. This process was repeated until Section D at Site 1 was complete, then the same process was used for Section D at Site 2. No problems driving the piles were encountered. Upon completion of the concrete sections, the contractor then came back and grouted one end of each panel to the concrete pile. This was done to prevent movement of the panels within the slots of the piles.

There were problems encountered with the concrete panels. It appears that the casting contractor's quality control was lacking because a number of the panels arrived on site with tie wires closer to the surface of the panel than allowed for in the specifications. This became obvious after the panels were in place a few days because visible rust areas appeared on the surface of the panel. The contractor choose to remove each panel, chip out the areas where the tie wire was too close to the surface, cut the wire back to meet the specified cover and grout the holes with an epoxy grout. This took a considerable amount of time to complete.

9. Construction change orders and field changes.

There were no modifications executed for this contract.

10. Pipeline and other utility crossings.

Structure	Owner	Rep. To Contact
NONE	——	——

11. Safety and Accidents.

One accident occurred during the construction of this project. The accident did not occur on the job site. It occurred at the yard of the contractor and there were no NRCS quality assurance personnel present at the time of the accident. The accident occurred during the movement of the concrete piles and panels from the contractor's yard. A deck hand's foot was crushed when the tug impacted the material barge and the loaded pilings shifted as a result of the impact.

12. Additional comments pertaining to construction, completed project, etc.

See the attached NRCS Supplements.

13. Significant Construction Dates: To be filled out by DNR Construction Project Manager or Contracting Officer for construction for Agency responsible for construction.

Bid I.D. (Construction, 50-7217-1-1)	Date
Bid Opening	10/11/00
Construction Contract Award	10/30/00
Preconstruction Conference	11/28/00
Notice to Proceed	12/4/00
Mobilization	12/16/00
Construction Start	12/22/00
Construction Completion	7/14/01
Final Acceptance	7/19/01

If different bids are taken, repeat this table to individually reflect each bid and attach tables.

Other significant Project Dates

	Date
Project Implementation closeout**	This item will be completed when all phases of the project are constructed
Start of Preconstruction Monitoring***	
Preconstruction Aerial Photography Acquisition***	
Monitoring Plan Completion***	

** Final implementation closeout is made by either the DNR Project Manager or the Federal Agency Contracting Officer depending on which organization had lead role for construction of project.
*** To be completed by DNR Project Manager.

NRCS SUPPLEMENT TO COMPLETION REPORT

CONTRACT ADMINISTRATION

List any significant problems encountered in the administration of the construction contract and recommended solution for future contract of like nature.

DESCRIPTION OF PROBLEM ENCOUNTERED	RECOMMENDATIONS FOR FUTURE CONTRACTS
In the total rock riprap sections A and A1 at both Sites 1 and 2, excessive amounts of settlement occurred.	The work on the described sections was terminated for convenience. On long reaches of work of this type, the contract needs to include the flexibility to relocate planned "fish dips" to utilize areas of excessive settlement as described rather than terminating a portion of the work. Further discussions need to be entered into regarding this matter for future contracts.

CONSTRUCTION PLANS

List any items pertinent to the plans which caused problems, need clarification or changes for future contracts of this nature.

DESCRIPTION OF ITEM IN PLANS	RECOMMENDATIONS FOR FUTURE CONTRACTS
1.There was problems with the bottom corners of the concrete panels being chipped when placed into the notches of the piles.	Recommend designing a stainless steel shoe to protect both the bottom corners of the concrete panel and the notch in the pile. This would provide a bearing surface other than concrete.
2. Concrete panel attachment to piles	Require that one end of each panel be grouted to one pile to resist rocking motion in the notch
3. Concrete panels and piles	Varying lengths of panels needs to be specified in long reaches of this type of construction. This would allow for varying the location of piles in the event that an obstruction is encountered during driving.

CONSTRUCTION SPECIFICATIONS

List any significant items in the construction specifications which caused problems, need clarification or changes for future contracts of this nature.

DESCRIPTION OF ITEM IN SPECIFICATIONS	RECOMMENDATIONS FOR FUTURE CONTRACTS
1. Encapsulated lightweight aggregate	Recommend that the specifications require that the lightweight aggregate be totally encapsulated in the geotextile (bag, geotube, sewn geotextile tubes) prior to placement. This method observed on other jobs appears to be more efficient than encapsulating the lightweight aggregate after placement.
2. Contractor Quality Control – Requirements for daily QC reports	The Items of work need to expand on Section 6 Records of the National Spec. to include the following: In addition to any tests, the contractor shall provide to the Inspector each day at the job site a daily quality control report for the previous days activities that includes the following items: Date Report No. Weather Conditions Quantities of Work Performed A narrative description of the work performed with the location and the equipment and labor used to perform the work. Materials delivered to job site Any safety items Personnel on site and hours worked (supervisory, skilled, and unskilled) Equipment on site and hours operated General comments Signed by Contractor QC representative. These daily reports shall be inclusive of the work, equipment, personnel, etc. of the prime contractor and any and all subcontractors on the job site.
3. Pre-stressed concrete members	Require the contractor to provide 2 weeks notice prior to casting any of the pre-stressed members.

GENERAL COMMENTS

List any significant items which worked well and should be repeated or which caused problems, need clarification or changes for future contracts of this nature.

DESCRIPTION OF ITEM	RECOMMENDATIONS FOR FUTURE CONTRACTS
1. Quality assurance of pre-stress concrete members	Recommend that an Inspector be present at the casting yard during the production of any pre-stressed concrete members. This would cost more, but would ensure a better finished product.

LANDBRIDGE TEST SECTIONS
CONSTRUCTABILITY EVALUATION

General:

1. **What degree of dredging was needed to provide sufficient floatation?**
   No additional dredging was required to facilitate any of the equipment needed to construct the various rock, composite rock, and concrete wall segments of this contract. Actually, if the concrete wall were the only method of construction, a smaller channel could be excavated for the needed equipment as compared to that required for typical rock dike construction. Smaller material barges can be used to transport the piles and panels than rock barges.

2. **Was Placement of spoil on the bayou side problematic?**
   There was no problem placing the spoil on the bayou side of the excavated access channel. However when this practice is employed, there must be enough temporary signs in place to adequately identify the locations of the spoil for safety reasons.

3. **To what extent and over what time frame did the spoil migrate back into the floatation channel?**
   In this particular contract, there were no problems with the spoil moving back into the access channel.

4. **To what degree was the backfilling of the access channel successful?**
   Backfilling the access channel was successful. The degree of success is dependent upon the level of inspection to assure that the requirements of the specifications are adhered to.

Traditional Foreshore Dike (Section A)

1. **How did the estimated quantity compare with actual rock quantity used?**
   See attached sheet LANDBRIDGE COST SUMMARY. Section A was terminated for convenience at both Sites 1 and 2 due to the excessive amount of settlement that occurred during construction. The specifications required the contractor to place the rock dikes to the lines and grades as shown on the drawings with a vertical tolerance of +0.5'. During construction the contractor never quite attained the specified grade prior to the start of excessive settlement. As such the contractor wanted to continue to place rock on the sections, even though they were rapidly settling. At that point the Contracting Officer terminated for convenience all work on sections A & A1. The largest settlement occurred at Site 1 (see attached sheet LANDBRIDGE SETTLEMENT PLATE DATA). Further investigation of the foundation conditions at Site 1 Section A will take place in the future.

   Estimated time to construct a considerable length (5000 feet)
   See attached sheet PERFORMANCE TIME SUMMARY LANDBRIDGE PROJECT

3. **Describe any other concerns or problems encountered during construction**
   This has been the most comment shoreline protection method employed to date (full rock riprap dike). This method is relatively easy to construct; however the cost efficiency of this construction method is dependent upon the foundation conditions.

Foreshore Dike Placed Over Shaped Spoil (Section A1)

1. **How did the estimated quantity compare with actual rock quantity used?**
   See attached sheet LANDBRIDGE COST SUMMARY.

2. **Did spoil form adequate "core", were problems placing rock on the spoil encountered, and were rock quantities reduced?**
   At Site 1 there was no appreciable difference in the settlement of Section A versus Section A1. At Site 2 there was a reduction in settlement in Section A1 as compared to Section A. (See attached LANDBRIDGE SETTLEMENT PLATE DATA) Shaping the spoil prior to the placement of the geotextile and subsequent rock placement took a considerable amount of time. This increase in time relates to an increase in cost. Placing the geotextile was slightly more difficult over the shaped spoil, but placement of the rock was the same as for any other method. The areas where the settlement was reduced appeared to be higher in clay content than the other locations. Use of this method to reduce rock quantities will be totally dependent upon the foundation soils.

3. **Estimated time to construct a considerable length (5000 feet)**
   See attached sheet PERFORMANCE TIME SUMMARY LANDBRIDGE PROJECT

4 **Describe any other concerns or problems encountered during construction**
   The major concern with this type of construction method is the time required to shape the spoil prior to the geotextile placement. The material needs to be initially placed and allowed to consolidate for a number of days (30 to 60) prior to shaping. This increases the time and cost for this method. Also the volume of spoil used to form the core of the dike is insignificant compared to the typical volume excavated to provide access. With that being the case, typically spoil will need to be backfilled into the access channel after completion of the work.

Foreshore Dike With Encapsulated Lightweight Aggregate Core (Section B)

1. **How did the estimated quantities compare with actual rock & lightweight aggregate quantities used?**
   See attached sheet LANDBRIDGE COST SUMMARY.

2. **Describe method of encapsulating used by the contractor, and its apparent efficiency**
   The contractor placed two layers of geotextile. The bottom layer was placed using pipes driven into the bottom at the perimeter of the geotextile panel. This panel was secured to the pipes with ropes. The second panel was then stretched over the first panel placed and secured in the same manner. Placing the second panel was somewhat troublesome for the contractor because it tended to snag and not move freely over the bottom panel. When both geotextile panels were in place, the contractor began placing the lightweight aggregate to the lines and grades specified. When the lightweight aggregate was placed, the contractor began folding the edges of the top geotextile panel over the aggregate. This was accomplished by using hand labor and excavators. After both edges were folded over the aggregate and lapped, the contractor pinned the aggregate with rock to hold it in place. Then the final rock riprap was placed to lines and grades.

3. **Describe other methods of encapsulating the lightweight aggregate that might be more efficient**

   From other construction projects where lightweight aggregate has been utilized and encapsulated prior to placement, the efficiency seems to be greater. An alternative method used is to place the aggregate in geotextile bags, sew the bags closed and place the bags as the core of the dike. This method was utilized on Barataria Bay Waterway East project and appeared highly efficient.

4. **Estimated time to construct a considerable length (5000 feet)**

   See attached sheet PERFORMANCE TIME SUMMARY LANDBRIDGE PROJECT

5. **Compare cost, quantities, and efficiencies of encapsulated vs. non encapsulated lightweight aggregate**

   To date no NRCS project have employed the use of lightweight aggregate core that has not been encapsulated. Because of this, comparison of encapsulated vs. non encapsulated lightweight aggregate is not possible at this time. The concern with not encapsulating the lightweight aggregate is movement of the material if any wave action is present and material floating off. An additional concern is trying to shape the lightweight aggregate placed in water. The material tends to slough and develop very flat slopes when placed in water and not encapsulated.

   For comparisons of quantities, cost, efficiencies (time to construct), and short term stability's of the furrow encapsulated method vs. the encapsulated method, refer to the attached Landbridge Cost Summary, Performance Time Summary Landbridge Project and Landbridge Settlement Plate Data.

   The construction of this composite section was rather labor intensive; however it took less actual time to construct than the furrow method. Multiple passes are required over the same section of dike to complete construction. One possibility of increased efficiency could be to encapsulate the lightweight aggregate prior to placement, removing the time consuming activity of trying to shape the material in the water prior to encapsulating it.

6. **Describe any other concerns or problems encountered during construction**

   One problem encountered was the lightweight aggregate sloughed to flatter slopes in the water prior to being encapsulated. This did not occur in the furrow method of placement since rock riprap was in place to confine the aggregate. Without either confining the lightweight aggregate with riprap at the toes or placing the lightweight aggregate in bags or some other confinement prior to placement in the water, controlling the placed section of the lightweight aggregate is very difficult.

Foreshore Dike with Lightweight Aggregate Core Placed in Furrow (Section C)

1. **How did the estimated quantities compare with actual rock & lightweight aggregate quantities used?**

   See attached sheet LANDBRIDGE COST SUMMARY.

2. **Describe method of placement used by the contractor, and its apparent efficiency**

   The contractor placed an initial layer of geotextile fabric to cover the "foot print" of the completed section and secured it. When the geotextile panel was in place, the contractor began placing rock riprap to form the "furrow" to the lines and grades specified. Upon

completion of the furrow, another layer of geotextile fabric was placed over the furrow and in place riprap and secured. The lightweight aggregate was then placed in the furrow on top of the second geotextile fabric. When the lightweight aggregate was placed and shaped, the contractor began folding the edges of the top geotextile panel over the aggregate. This was accomplished by using hand labor and excavators. After both edges were folded over the aggregate and lapped, the contractor pinned the aggregate with rock to hold it in place. Then the final rock riprap was placed to lines and grades.

3. **Compare the efficiency of the furrow method of placement with the encapsulating method**

   Placement of this method required the most actual construction time of all of the methods constructed. This is due partially because an additional pass has to be made over the same section as compared to the encapsulated method. The additional pass is required to make an initial placement of rock riprap to form the furrow into which the lightweight aggregate will be placed. This method also was labor intensive because two sections of geotextile panels had to be placed.

4. **Estimated time to construct a considerable length (5000 feet)**

   See attached sheet PERFORMANCE TIME SUMMARY LANDBRIDGE PROJECT

5. **Compare cost, quantities, and efficiencies of furrow vs. other methods of placing lightweight aggregate**

   See attached sheet LANDBRIDGE COST SUMMARY for comparison of two types of placement methods within this contract. On Bartaria Bay Waterway East, the lightweight aggregate was bid for $62.22 per cubic yard compared to $60.00 per cubic yard for this project. With the requirement of an additional layer of geotextile required for the furrow method not included in the $60.00 per cubic yard as compared to the bagged method used on Barataria Bay Waterway, the cost is comparable. The bagged method appeared to be the more efficient of the two.

6. **Would it be feasible to use earth to form the furrows?**

   Using earth to form the furrows for the lightweight aggregate does not seem feasible. The material would need to be shaped as it is being excavated placed. When excavated much of the native material does not have enough strength to allow it to be shaped until it has consolidated for a number of days. Also controlling the configuration of the earth would be extremely difficult.

7. **Describe any other concerns or problems encountered during construction**

Concrete Wall (Section D)

1. **What draft depth is needed for equipment to construct the wall?**

   Less depth was required to construct the wall than was required to access rock barges for the other sections.

2. **What would be the max and min distances from the access channel to wall?**

   The wall was constructed with top of the access channel 40 feet from the centerline of the wall.

3. **Is it feasible to drive 80 foot piles to the tolerances needed to construct such a wall?**
   Eighty-foot piles were used in this project and were placed to the tolerances specified without any difficulties. A contractor will have to have a good template in order maintain the specified tolerances.

4. **Estimated time to construct a considerable length (5000 feet)**
   See attached sheet PERFORMANCE TIME SUMMARY LANDBRIDGE PROJECT. The construction of the wall took less actual work time than did any of the other methods.

5. **What can be done if obstructions are encountered or to turn angles in the alignment?**
   If a long alignment of this type of structure were to be considered, various lengths of panels would need to be cast. This would allow for movement laterally of a pile if an obstruction were encountered. Another option could be to utilize the section where the obstruction is to be an ingress/egress location for marine organisms.

   To turn angles would only require the use of two piles adjacent to one another.

6. **Describe any other concerns or problems encountered during construction**
   One major concern is the aesthetics of a wall.

LANDBRIDGE COST DATA

Site #1

Section	Item of Work	Est.Quan.	Act.Quan.	Unit	Unit Price	Amount	Start Date	End Date
Sections A&A1	Mobilization and Demobilization	1	1	Job	L.S.	$8,125.00	1/8/01	2/15/01
	Surveying	1	1	Job	L.S.	$1,500.00		
	Quality Control	1	1	Job	L.S.	$1,250.00		
	Pollution Control	1	1	Job	L.S.	$250.00		
	Geotextile	2810	2812.44	S.Y.	$5.50	$15,468.42		
	400# rock	5055	5739	Tons	$36.00	$206,604.00		
	Settlement Plates	2	2	EA	$1,000.00	$2,000.00		
		1	1	Job	L.S.	$2,000.00		
						$237,197.42		
					Cost per Linear Foot	$563.41		
Section B	Mobilization and Demobilization	1	1	Job	L.S.	$8,125.00	2/1/01	2/19/01
	Surveying	1	1	Job	L.S.	$1,500.00		
	Quality Control	1	1	Job	L.S.	$1,250.00		
	Pollution Control	1	1	Job	L.S.	$250.00		
	Geotextile	2840	2812.44	S.Y.	$5.50	$15,468.42		
	400# rock	3295	2400	Tons	$36.00	$86,400.00		
	Settlement Plates	2	2	EA	$1,000.00	$2,000.00		
	Warning Signs	1	1	Job	L.S.	$2,000.00		
	Light Weight Aggregate, Encapsulated	1280	1400	CY	$60.00	$84,000.00		
					Total Cost	$200,993.42		
					Cost per Linear Foot	$470.71		
Section C	Mobilization and Demobilization	1	1	Job	L.S.	$8,125.00	1/24/01	3/21/01
	Surveying	1	1	Job	L.S.	$1,500.00		
	Quality Control	1	1	Job	L.S.	$1,250.00		
	Pollution Control	1	1	Job	L.S.	$250.00		
	Geotextile	1970	2209.77	S.Y.	$5.50	$12,153.74		
	400# rock	2945	2885	Tons	$36.00	$103,860.00		
	Settlement Plates	2	2	EA	$1,000.00	$2,000.00		
	Warning Signs	1	1	Job	L.S.	$2,000.00		
	Light Weight Aggregate, Encapsulated	530	552	CY	$60.00	$33,120.00		
					Total Cost	$164,258.74		
					Cost per Linear Foot	$388.78		
Section D	Mobilization and Demobilization	1	1	Job	L.S.	$8,125.00	3/19/01	4/13/01
	Surveying	1	1	Job	L.S.	$1,500.00		
	Quality Control	1	1	Job	L.S.	$1,250.00		
	Pollution Control	1	1	Job	L.S.	$250.00		
	Warning Signs	1	1	Job	L.S.	$2,000.00		
	Surface Coarse Aggregate			Tons	$40.00			
	Concrete Precast Prestressed Piles 80 ft	20	20	EA	$5,400.00	$108,000.00		
	Concrete Precast Prestressed Panels	19	19	EA	$3,000.00	$57,000.00		
					Total Cost	$178,125.00		
					Cost per Linear Foot	$445.31		

Site #2

Section	Item of Work	Quantity	Quantity	Unit	Unit Price	Amount	Start Date	End Date
Sections A & A1	Mobilization and Demobilization	1	1	Job	L.S.	$8,125.00	2/15/01	3/6/01
	Surveying	1	1	Job	L.S.	$1,500.00		
	Quality Control	1	1	Job	L.S.	$1,250.00		
	Pollution Control	1	1	Job	L.S.	$250.00		
	Geotextile	2815	2812.44	S.Y.	$5.50	$15,468.42		
	400# rock	4315	3719	Tons	$36.00	$133,884.00		
	Settlement Plates	2	2	EA	$1,000.00	$2,000.00		
	Warning Signs	1	1	Job	L.S.	$2,000.00		
					Total Cost	$164,477.42		
					Cost per Linear Foot	$386.10		
Section B	Mobilization and Demobilization	1	1	Job	L.S.	$8,125.00	2/22/01	3/27/01
	Surveying	1	1	Job	L.S.	$1,500.00		
	Quality Control	1	1	Job	L.S.	$1,250.00		
	Pollution Control	1	1	Job	L.S.	$250.00		
	Geotextile	2840	2812.44	S.Y.	$5.50	$15,468.42		
	400# rock	3295	1556	Tons	$36.00	$56,016.00		
	Settlement Plates	2	2	EA	$1,000.00	$2,000.00		
	Warning Signs	1	1	Job	L.S.	$2,000.00		
	Light Weight Aggregate, Encapsulated	1280	1034	CY	$60.00	$62,040.00		
					Total Cost	$148,649.42		
					Cost per Linear Foot	$352.67		
Section C	Mobilization and Demobilization	1	1	Job	L.S.	$8,125.00	2/20/01	3/15/01
	Surveying	1	1	Job	L.S.	$1,500.00		
	Quality Control	1	1	Job	L.S.	$1,250.00		
	Pollution Control	1	1	Job	L.S.	$250.00		
	Geotextile	2025	2209.77	S.Y.	$5.50	$12,153.74		
	400# rock	3140	2783	Tons	$36.00	$100,188.00		
	Settlement Plates	2	2	EA	$1,000.00	$2,000.00		
	Warning Signs	1	1	Job	L.S.	$2,000.00		
	Light Weight Aggregate, Encapsulated	550	865	CY	$60.00	$51,900.00		
					Total Cost	$179,366.74		
					Cost per Linear Foot	$424.03		
Section D	Mobilization and Demobilization			Job		$8,125.00	4/18/01	4/30/01
	Surveying	1	1	Job	L.S.	$1,500.00		
	Quality Control	1	1	Job	L.S.	$1,250.00		
	Pollution Control	1	1	Job	L.S.	$250.00		
	Warning Signs	1		Job	L.S.	$2,000.00		
	Surface Coarse Aggregate			Tons	$40.00			
	Concrete Precast Prestressed Piles 80 ft	20	20	EA	$5,400.00	$108,000.00		
	Concrete Precast Prestressed Panels	19	19	EA	$3,000.00	$57,000.00		
					Total Cost	$178,125.00		
					Cost per Linear Foot	$445.31		

LANDBRIDGE PERFORMANCE DATA

Site #1		Site #2	
Excavation Access Channel 1200'	40 hours	Excavation Access Channel 2543'	65 hours
Excavation Floation Channel 1860'	56 hours	Excavation Floation Channel 1824'	57 hours
Backfill Channel	10 hours	Backfill Channel	64 hours
Total	**106 hours**	**Total**	**186 hours**
Site #1 - Section A1 & A		**Site #2 - Section A&A1**	
Section A1		Placement Spoil Core	12 hours
Placement spoil core 200'	10 hours	Placement geotextile panel	6 hours
Placement of geotextile base panel	5 hours	Placement Rock Riprap	69 hours
Placement of rock riprap	54.5 hours		
	Sub-69.5 hours		
Section A			
Placement of rock riprap	37 hours		
Sections A&A1 Total	**106.5 hours**	**Section A&A1 Total**	**87 hours**
Site #1 - Section B		**Site #2 - Section B**	
Placement of geotextile base panel	5 hours	Placement geotextile base panel	5 hours
Placment of encapsulation geotextile	3 hours	Placement geotextile encapsulation panel	5 hours
Placement of light weight aggregate	23 hours	Placement Light Weight Aggregate	20 hours
Placement of rock riprap	52 hours	Placement rock riprap	50 hours
Section B Total	**83 hours**	**Section B Total**	**80 hours**
Site #1 - Section C		**Site #2 Sec C**	
Placement of geotextile base panel	6 hours	Placement geotextile base panel	2.5 hours
Placement of encapsulation geotextile	3 hours	Placement geotextile encapsulation panel	4 hours
Placement of light weight aggregate	18 hours	Placement Light Weight Aggregate	14 hours
Placement of rock riprap	67 hours	Placement rock riprap	82 hours
Section C Total	**94 hours**	**Section C Total**	**102.5 hours**
Site #1 - Section D		**Site #2 - Section D**	
Placement piles and panels	71.5 hours	Placemnt concrete piles and panels	64.5 hours
Placement of surface coarse aggregate	9 hours	Placement of surface coarse aggregate	9 hours
Section D Total	**80.5**	**Section D Total**	**73.5 hours**

TOTAL PROJECT HOURS 999

LANDBRIDGE SETTLEMENT PLATE DATA

Date Placed	Date Checked	Station	Elevation	Amount Settled (feet)
Site #1 Sec. A				
1/1/01		1+35	9.8	
400# rock	1/24/01	1+35	7.36	2.44
400# rock	2/14/01	1+35	6.9	2.9
		Pipe not accesible		
1/15/01		3+35	7.2	
400# rock	1/24/01	3+35	1.9	5.3
400# rock	2/24/01	3+35	1.16	6.04
400# rock	2/24/01	3+35	10	10' Extension Added
	5/17/01	3+35	5.82	11.33
Site #1 Sec. B				
2/6/01		6+10	8.7	
aggregate	2/8/01	6+10	8.62	0.08
400# rock	2/14/01	6+10	7.6	1.1
400# rock	2/21/01	6+10	7.48	1.22
400# rock	3/14/01	6+10	7.01	1.69
	3/30/01	6+10	6.65	2.05
	4/27/01	6+10	6.64	2.06
	5/17/01	6+10	6.47	2.23
2/6/01		8+10	7.4	
aggregate	2/8/01	8+10	6.88	0.52
400# rock	2/14/01	8+10	6.18	1.22
400# rock	2/21/01	8+10	5.57	1.83
400# rock	3/14/01	8+10	5.16	2.24
	3/30/01	8+10	4.8	2.5
	4/27/01	8+10	4.78	2.62
	5/17/01	8+10	4.58	2.82
Site #1 Sec C				
2/12/01		10+85	7.4	
aggregate	3/6/01	10+85	7.17	2.3
400# rock	3/9/01	10+85	6.97	0.2
400# rock	3/14/01	10+85	6.68	0.72
	3/30/01	10+85	6.2	1.2
	4/13/01	10+85	6.05	1.35
	4/27/01	10+85	6.03	1.37
	5/17/01	10+85	5.93	1.47
2/13/01		12+85	8.4	
aggregate	3/6/01	12+85	8.01	0.39
400# rock	3/14/01	12+85	7.4	1
	3/30/01	12+85	6.98	1.45
	4/13/01	12+85	6.85	1.55
	4/27/01	12+85	6.84	1.56
	5/17/01	12+85	6.78	1.62

Date Placed	Date Cheked	Station	Elevation	Amount Settled (feet)
Site #2 Sec. A				
2/15/01		17+24	10.75	
400# rock	3/2/01	17+24	9.96	0.79
400# rock	3/6/01	17+24	9.52	1.23
400# rock	3/9/01	17+24	9.3	1.45
	3/30/01	17+24	8.79	1.96
	4/27/01	17+24	8.6	2.15
	5/17/01	17+24	8.49	2.26
2/15/01		15+24	7.8	
400# rock	3/2/01	15+24	6.16	1.64
400# rock	3/9/01	15+24	5.6	2.2
	3/30/01	15+24	5.1	2.7
	4/27/01	15+24	4.87	2.93
	5/17/01	15+24	4.79	3.01

Site #2 Sec. B				
3/13/01		12+49	7.8	
aggregate	3/16/01	12+49	7.37	0.43
400# rock	3/22/01	12+49	6.8	1
	3/30/01	12+49	6.56	1.24
	4/27/01	12+49	6.32	1.48
	5/17/01	12+49	6.24	1.56
3/15/01		10+43	7.8	
aggregate	3/16/01	10+43	7.6	0.2
400# rock	3/22/01	10+43	7.08	0.72
	3/30/01	10+43	6.76	1.04
	4/27/01	10+43	6.55	1.25
	5/17/01	10+43	6.49	1.31

Site #2 Sec. C				
3/7/01		1+50	8.6	
aggregate	3/10/01	1+50	7.71	0.89
400# rock	3/15/01	1+50	7.33	1.27
	3/30/01	1+50	6.94	1.66
	4/27/01	1+50	6.66	1.94
	5/17/01	1+50	6.26	2.34
3/7/01		3+50	8.7	
400# rock	3/10/01	3+50	8.08	0.62
400# rock	3/15/01	3+50	7.32	1.38
	3/30/01	3+50	6.64	2.06
	4/27/01	3+50	6.33	2.37
	5/17/01	3+50	6.26	2.44