PROJECT COMPLETION REPORT

PROJECT NAME	**Caernarvon Outfall Management Project**
CWPPRA/STATE PROJECT NO.	**BS-3a**

Report Date: **January 8, 2003** **BY:** **USDA - NRCS**

1. Project Managers/Contracting Officer:

DNR Project Manager	George Boddie	Telephone	(504) 288-7153
DNR Construction Project Manager	Paul Gremillion	Telephone	(504) 283-1771
DNR Monitoring Manager	Michael Sealy	Telephone	(504) 288-7595
Federal Agency Project Manager	Loland Broussard	Telephone	(337) 291-3060
Federal Agency Contracting Officer	Charles Phillips	Telephone	(318) 473-7796
Federal Agency Construction Engineer	Dale Garber	Telephone	(985) 447-6050
Federal Agency Design Engineer	Cherie LaFleur	Telephone	(318) 473-7674
Federal Agency Construction Inspector	Melvin Rodrigue	Telephone	(985) 447-6050

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

The Caernarvon Diversion Outfall Management Project receives fresh water from the Mississippi River through the Caernarvon Diversion Structure located on the east bank of the Mississippi River near the St. Bernard / Plaquemines Parish line. The Caernarvon Outfall Management Project benefited area consists of 18,200 acres and is bounded by the Forty Arpent Canal levee to the north and west, and by Lake Lery, Bayou Mandeville, and the Caernarvon Canal to the east. The southern boundary is a composite of undifferentiated marsh, Reggio Canal, the Pipeline Canal, and River aux Chenes.

The objective of the project is to promote better utilization and distribution of freshwater and nutrients from the Mississippi River, introduced in the project area by the Caernarvon Structure during low-diversion discharge periods. Management of the outfall will allow the water from existing channels into the interior marshes. Placement of channel plugs and water control structures with pipes along with designated spoil bank restoration will enhance water retention and distribution within the project area.

This will be accomplished by increasing river water distribution within interior marshes via placement of water control structures (pipe conduits) in existing closures (i.e. plugs and embankments). The proposed structures will be located adjacent to existing oilfield and pipeline canals that serve as major conveyance channels for river water distribution within the project area. Installing water control structures in existing closures will allow access of river water into interior wetlands that are currently deprived of such resource. The restoring of canal embankments and installation of channel plugs at strategic sites will prevent circumvention of diverted flows and further enhance river water dispersion. Wetland areas immediately east of Big Mar and north of Lake Lery will continue deriving the benefits from the Caernarvon Diversion.

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

This project consisted of the installation of eight water control structures, two rock riprap channel plugs, and two reaches of spoil bank restoration as listed below.

Water Control Structures:

- Site 13 – Rockfill core plug with 1.5' thick rock riprap armor with a 48" diameter corrugated aluminum pipe with an aluminum combination gate installed on the interior side of the pipe.
- Site 25 - Rockfill core plug with 1.5' thick rock riprap armor and two 48" diameter corrugated aluminum pipes with aluminum canal gates installed on the exterior side of the pipes.
- Site 26 – Earth core plug with 1.5' thick rock riprap armor and four 48" diameter corrugated aluminum pipes with aluminum canal gates installed on the exterior side of the pipes.
- Site 40 - Rockfill core plug with 1.5' thick rock riprap armor and two 48" diameter corrugated aluminum pipes with aluminum canal gates installed on the exterior side of the pipes.
- Site 50 - Rockfill core plug with 1.5' thick rock riprap armor with a 48" diameter corrugated aluminum pipe with an aluminum combination gate installed on the interior side of the pipe.
- Site 52 - Rockfill core plug with 1.5' thick rock riprap armor and two 36" diameter corrugated aluminum pipes with aluminum combination gates installed on the interior side of the pipes.
- Site 54 - Rockfill core plug with 1.5' thick rock riprap armor and two 48" diameter corrugated aluminum pipes with aluminum canal gates installed on the exterior side of the pipes.
- Site 60 - Rockfill core plug with 1.5' thick rock riprap armor and two 36" diameter corrugated aluminum pipes with aluminum combination gates installed on the interior side of the pipes.

Rock Riprap Channel Plugs:

- Site 32 – Rock Riprap Plug with 60' of channel slope protection
- Site 56 – Rock Riprap Plug

Spoil Bank Restoration:

- Site 57 – Earthen spoilbank restoration along Reggio Canal between Sites 40 & 54
- Site 58 – Earthen spoilbank restoration along Bayou Mandeville between Delacroix Canal and Site 13

For completed actual dimensions, locations, elevations, and materials, refer to the "As Built" drawings.

Actual Benefited Acres 18,200

4. Key project cost elements

	CWPPRA Project Cost Estimates**	**Cost Incurred as of Construction Completion**
Construction	$ 2,661,924.00	$ 2,118,218.00
E & D	$ 392,899.00	$ 268,150.00
Landrights	$ 20,840.00	-
Monitoring	$ 812,670.00	$ 3,037.00
O & M	$ 94,223.00	$ 1,453.94
Total	$ 3,982,556.00	$ 2,390,858.94

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

5. Items of Work Construction Unit #2

Item No.	Work	Est. Quant.	Unit	Est. Unit Price	Est. Amount	Final Quant.	Bid Unit Price	Final Amount	% Over /Under
1	Mobilization and Demobilization	1	Job	LS	$ 215,000.00	1	$133,000.00	$133,000.00	0
2	Pollution Control	1	Job	LS	$ 10,000.00	1	$ 11,000.00	$ 11,000.00	0
3	Permanent Vegetation	20	Ac.	$ 166.00	$ 3,320.00	12.36	$ 500.00	$ 6,180.00	38.2
4	Overseeding	5	Ac.	$ 490.00	$ 2,450.00	0	$ 2,400.00	$ 0.00	100
5	Removal of Water	1	Job	LS	$ 120,000.00	1	$265,000.00	$265,000.00	0
6	Clearing & Grubbing	1	Job	LS	$ 5,000.00	1	$ 58,000.00	$ 58,000.00	0
7	Timber Piles 40' Length	120	Ea.	$ 830.00	$ 99,600.00	120	$ 1,000.00	$120,000.00	0
8	Timber Piles 50' Length	76	Ea.	$ 885.00	$ 67,260.00	76	$ 1,200.00	$ 91,200.00	0
9	Excavation, Floatation Access, Sites 25 & 32	1	Job	LS	$ 65,688.00	1	$100,000.00	$100,000.00	0
10	Earthfill, Sites 25, 26, 40, & 54	680	C.Y.	$ 8.00	$ 5,440.00	867.0	$ 16.00	$ 13,872.00	27.5
11	Rockfill, Sites 13, 50, 52, & 60	1020	Tons	$ 26.00	$ 26,520.00	1371.61	$ 78.00	$106,985.58	34.5
12	Corrugated Metal Pipe 36" Aluminum	240	L.F.	$ 115.00	$ 27,600.00	240	$ 122.00	$ 29,280.00	0
13	Corrugated Metal Pipe 48" Aluminum	720	L.F.	$ 150.00	$ 108,000.00	720.6	$ 133.00	$ 95,839.80	0.08
14	Water Control Gate 36" Combination Gate	4	Ea.	$ 5,915.00	$ 23,660.00	4	$ 10,500.00	$ 42,000.00	0
15	Water Control Gate 48" Combination Gate	2	Ea.	$11,054.00	$ 22,108.00	2	$ 14,000.00	$ 28,000.00	0
16	Water Control Gate 48" Canal Gate	10	Ea.	$ 8,290.00	$ 82,900.00	10	$ 11,100.00	$111,000.00	0
17	Identification Markers	4	Ea.	$ 880.00	$ 3,520.00	4	$ 900.00	$ 3,600.00	0
18	Timber Fab & Install Pipe Saddles & Walkways	1	Job	LS	$ 45,410.00	1	$85,5000.00	$85,500.00	0
19	Rock Riprap	8200	Tons	$ 40.00	$ 328,000.00	6,098.99	$ 50.00	$304,949.50	36.1
20	Geotextile	7910	S.Y.	$ 6.00	$ 47,460.00	8,682.07	$ 4.40	$ 38,201.11	9.8
21	Embankment Const. Spoilbank Restoration	10539	L.F.	$ 20.00	$ 210,780.00	10,760	$ 9.00	$ 96,840.00	2.1
22	Excavation, Site 54 Spoil Degradation	1	Job	LS	$ 572.00	1	$ 8,000.00	$ 8,000.00	0

Original Est. Amount $ 1,520,288.00

Original Bid Amount $1,833,435.00

Original Contract Final Amount (less Mods) $1,748,447.99

MODIFICATIONS

23	Rockfill, Additional at Site 60 (Mod #2)	802	Tons	$ 78.00	$ 62,556.00	713.47	$ 72.00	$ 51,369.84	11.0
24	Rockfill, Additional at Site 25 (Mod #3)	320	Tons	$ 78.00	$ 24,960.00	266.72	$ 71.00	$ 18,937.12	16.7
25	Timber Fabrication 4x4x20' Posts (Mod #6)	16	Ea.	$ 102.23	$ 1,619.60	16	$ 98.00	$ 1,568.00	0
26	Timber Fab. Walkway Exten. Site 54 (Mod#7)	1	Job	LS	$ 2,075.04	1	$ 2,460.00	$ 2,460.00	0
27	Rockfill Site 54 (Mod#7	354	Tons	$ 78.00	$ 120,000.00	252.45	$ 78.00	$ 19,691.10	28.7
28	Rockfill Site 54 (Mod#8	286	Tons	$ 78.00	$ 22,308.00	222.83	$ 78.00	$ 17,380.74	22.1
29	Riprap Site 32 (Mod #9)	130	Tons	$ 50.00	$ 6,500.00	130	$ 55.00	$ 7,150.00	0
30	Geotextile Site 32 (Mod #9)	350	S.Y.	$ 4.50	$ 1,575.00	350	$ 4.50	$ 1,575.00	0
31	Conspicuity Tape	1	Job	LS	$ 500.00	1	$ 390.00	$ 390.00	0
32	Mob & Demob Site 26 Repair (Mod #10)	1	Job	LS	$ 750.00	1	$ 850.00	$ 850.00	0
33	Structure Removal Site 26 Repair (Mod #10)	1	Job	LS	$ 1,353.02	1	$ 2,000.00	$ 2,000.00	0
34	Timber Replacement Site 26 Repair (Mod #10)	.2	MBM	$11,608.86	$ 2,321.77	.2	$ 14,500.00	$ 2,900.00	0

Total Contract Modification Amount	$ 126,271.80
Less 2 days liquidated damages	- $ 1,000.00
Final Contract Amount*	**$1,873,719.79**

5. Construction and construction oversight

Prime construction contractor	Phylway Construction Inc.
Subcontractor	JAG Construction Services, Inc.
Original construction contract	$1,833,435.00
Change orders	$126,271.80
Under runs	-$84,987.01
Liquidated Damages	-$1,000.00
Final construction contract	**$1,873,719.79**

Oversight & Administration for Construction Units #2 & #3

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

7. Major equipment used.

- Spud barge (FS-117) with American 7250 Crane
- Spud barge (JAG III)
- Two - Cat 322 BL hydraulic excavators
- J.B. Yesso tug boat
- 120' x 30' deck barge
- Vibratory Hammer V-5B
- Conmaco Air Hammer
- Ingersoll Rand air compressor (825 cfm)

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

For the installation of the water control structures (pipe structures) the process was basically the same for all structures. The contractor first installed the sheetpile cofferdams at each site and then excavated the site to the specified depth. Due to the nature of the soils, the contractor would over excavate the site because the bottom of the excavation would heave from the uplift pressures as much as 1.5'. Next the timber piles were driven and the bottom timber pipe supports were installed. The pipes and associated gates were placed and the upper timber pipe supports were installed. The required area within the sheetpile cofferdam was then backfilled. Upon completion of the backfilling operation, the cofferdam was removed. Then placing the rock riprap cap and installing the walkways completed the structures. This process was employed for sites 13, 25, 26, 40, 50, 52, 54, and 60.

The rock riprap plugs were constructed by first placing the geotextile fabric and an initial lift of rock riprap. The specifications required the initial lift of riprap to be placed to an elevation of +2.0 and allowed to consolidate the foundation for 60 days. After the 60 day waiting period the remaining riprap was placed to the final lines and grades.

The earthen spoil bank restoration was accomplished by first placing a lift of earth material along the final alignment. The first lift was not shaped, and was allowed to dewater and consolidate for a period of time. The contractor then made a second pass adding additional earth material. In some locations this was adequate and the embankment was shaped to final lines and grades. For the largest portion of the spoil bank restoration, a third lift was necessary to obtain the specified lines and grades. Upon completion of the final shaping, the embankment was seeded to permanent vegetation.

The contractor began the overall work by starting at Site 25 and the spoil bank restoration areas. After the initial work began, the contractor moved repeatedly between sites. For that reason, a complete sequence of the contractor's activities for this report is not practical.

One problem encountered during construction was the lack of suitable earth materials to backfill around the corrugated aluminum pipes at sites 25, 54, and 40. Upon excavation of the sites, the material removed was deemed unsuitable for backfill; therefore modifications were written to change the fill material around the pipes to rock (ASTM C-33 Size 1).

Another problem encountered was a slope stability problem in an area on Bayou Mandeville of the spoil bank restoration. The alignment of the embankment was shifted away from the channel in this reach and the specified lines and grades finally obtained.

9. Construction change orders and field changes.

1. Modification #1: Added requirement for contractor to begin work within 20 days of Notice to Proceed – No time or cost change.
2. Modification #2: Added additional rockfill quantities at Site 60 of 802 tons – Performance time was increased 5 calendar days and dollar value of the contract increased $57,744.00
3. Modification #3: This modification was needed to change the fill material around the pipes to be installed at Site 25. Upon excavation of the site, not enough suitable materials were encountered to complete the earthfill required. The site had breached at some time prior to construction and a considerable amount of muck had filled the area. This modification changed the fill material adjacent to the pipes from earthfill to rockfill, which is used as fill around pipes at other sites within this contract. The additional estimated rockfill quantity at Site 25 was 320 tons. Performance time was increased 3 calendar days and dollar value of the contract increased $22,720.00
4. Modification #4: Made a pin and ink correction to the quantity shown on the schedule of modification #3 from 302 to 320 tons – No time or cost change.
5. Modification #5: Changed drawing sheet 19 of 28 to include bolting pattern dimensions of timber members – No time or cost change.

6. Modification #6: This modification was needed due to an omission in the drawings. The drawings did not accurately depict the number of 4"x 4"x 20' posts required for the walkway supports at sites 25, 26, 40, 52, 54, and 60. An additional 16 of the 4"x 4"x 20' posts were required to adequately support the walkways. Since the timber fabrication for both the walkways and pipe supports was bid as a lump sum, an additional bid item was added for the additional 16 posts. Performance time was increased 2 calendar days and dollar value of the contract increased $1,568.00.
7. Modification #7: This modification was needed in order to change the pipe alignment of Site 54. The original alignment had the potential to cause bank erosion of the Promise Land Canal bank. The modified alignment eliminated this problem, but required additional materials to construct the walkway. Also after the contractor excavated through existing plug at the site to perform the spoil bank degradation, it became apparent that the material was not be suitable for earthfill. For this reason, rockfill was needed to be utilized for bedding under and fill over the pipe structures. The additional estimated rockfill quantity at Site 54 was 354 tons. Performance time was increased 6 calendar days for the work within the modification and 3 additional days for Christmas Holidays and dollar value of the contract increased $30,072.00
8. Modification #8: This modification was needed in order to change the earthfill around the pipes at Site 40 to rockfill. Upon excavation of the site it has become apparent that the material was not suitable for earthfill. The change from earthfill to rockfill around the pipes reduced the earthfill quantity from the original estimated quantity of 160 CY to 60 CY and added 286 tons of rockfill. The addition of Bid Item 28 for the rockfill at this site was included. . Performance time was increased 10 calendar days for the work within the modification and 5 additional days for Modification #7 and dollar value of the contract increased $22,308.00
9. Modification #9: This modification was needed to protect Site 32 from being circumvented by water flowing around both ends of the structure and eroding a channel. During higher discharge rates from the Caernarvon diversion structure, a large volume of water was flowing around the ends of the rock plug at Site 32 and eroding the channel banks that lead into Lake Lery. The estimated rock riprap quantity was 130 tons and geotextile quantity was 350 square yards for this modification. This modification lined the channel banks on the Lake Lery side of the plug for approximately 70' from the centerline of the structure. Also included in this modification was the requirement to add conspicuity tape to the piles at Site 60 and to the warning sign piles at Sites 32 and 56. Performance time was increased 7 calendar days and dollar value of the contract increased $9,115.00.
10. Modification #10: A fire occurred at Site 26 damaging the timber walkway that accesses the site's gates. The origin of the fire is unknown; however it appears vandals started it. The damaged walkway needed to be repaired in order to access and operate the gates at the structure site. The modification included mobilization (since the contractor had completed all work on the contract, but final payment had not been made), structure removal as a lump sum, and timber replacement per board foot. Performance time was increased 6 calendar days and dollar value of the contract increased $5,750.00.

10. Pipeline and other utility crossings.

Structure	Owner	Rep. To Contact
Pipeline	Enterprise Products Operating	(225) 675-5378 (800) 506-8528
Pipeline	BP Oil Pipeline Company	Mr. Kenneth Smithpeters 1901 Engineer Rd. Belle Chase, LA 70037 (504) 393-6289
Pipeline	Creole Gas Pipeline Company	Mr. Gary Gilbert (318) 665-4426

11. Safety and Accidents.

There were no accidents or injuries reported during the construction of the project.

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

See attachments

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

Contract No.	**50-7217-1-6**
	Date
Bid Opening	2/23/2001
Construction Contract Award	4/12/2001
Preconstruction Conference	5/14/2001
Notice to Proceed	6/11/2001
Mobilization	6/30/2001
Construction Start	7/2/2001
Construction Completion	6/14/2002
Final Acceptance	9/10/2002

*Note: The three month delay from construction completion to final acceptance was due to work performed to repair the fire damage at Site 26. The delivery of the treated lumber , which had to be ordered, took the majority of the time.

NRCS SUPPLEMENT TO COMPLETION REPORT

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
Spoil disposal	In future contracts, ensure that all spoil disposal areas are large enough for the excavated materials and are adequately defined on the drawings.
Nails used to fasten aluminum pile cap to pile were not specified on the plans, and contract used small headed nails	On typical pile cap detail add the following requirements to the existing note: Cap shall be attached using a minimum of 8 stainless steel ring shanked roofing nails. Nails shall be minimum 12 gauge and 1 ½" in length.
Warning signs as currently designed present a safety problem in installation and are costly to fabricate due to the application of angles welded to the back of the signs.	Further analysis of the signs have been made and it has been determined that for the wind loads anticipated, no additional stiffeners are required on the back of the signs. Therefore it is recommended that typical sign details be changed to remove the angles from the back of the signs, and lag bolt the sign plate directly to the piles.
Due to differential settlement around the pipes, some of the pipes rotated slightly. This caused the gates that were attached to the pipes to be somewhat out of plumb.	In cases where foundation soils could pose a problem, and rotation of the pipe is a concern, it is recommended that the type pipe support used on Sabine National Wildlife Refuge (CS-23) be used. This support utilized an aluminum band over the top of the pipe that could be tightened to create a good friction connection against rotation.
Some of the bolts used to construct the timber walkways at the structures were longer than necessary and projected out from the structure causing a possible safety concern.	Recommend placing the note similar to the following on the drawings for timber construction similar to that in this contract: No projecting bolts will be allowed around the perimeter of the structure. Place head of bolt to the outside."

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
Dewatering and rock riprap placement requirements were not specific enough. Problems were encountered in placing the riprap under the inlet and outlet inverts of the pipes. This was done after the sheet pile cofferdams were removed.	When pipe structures are designed for future contracts, the removal of water specification (spec 11) needs to require that the contractor dewater and place in the dry the rock riprap under the pipe inverts to a minimum of 5' beyond the ends of the pipe. This is to ensure that the riprap is adequately placed in the areas most likely to experience scouring.
Special Provisions – Notification of Pipeline Companies.	In future contracts add an additional requirement that the contractor provides the Government a written statement if a pipeline company chooses **not** to be on site during construction around their lines. This should be provided to the Government at least 48 hours prior to any work being performed near the pipeline.
Specifications for warning signs (spec 93) require a neoprene or teflon washer between all aluminum signs and any metal at all points of contact.	Recommend changing specification to require teflon or nylon washers. The neoprene washers are too pliable. Also recommend adding this as a note on the typical sign drawing detail.
Problems were encountered with the steel sheet pile cofferdam used by the contractor to dewater the sites.	For future contracts where it is anticipated that sheet piling, etc. will be needed as a part of the dewatering plan, the following should be included in the removal of water specification (spec 11): "Any part of the dewatering plan that is structural in nature (i.e.: sheet pile cofferdams) shall be designed by a registered professional engineer."
Due to differential settlement around the pipes, some of the pipes rotated slightly. This caused the gates that were attached to the pipes to be somewhat out of plumb.	The specifications need to require that the gates must be plumb at the time of final acceptance. This may require the contractor to install the gates after the pipes have been in place and experience the initial settlement of the fill around them.