State of Louisiana
Coastal Protection and Restoration Authority
Operations Division

2012 Biennial Inspection Report

for

ATCHAFALAYA SEDIMENT DELIVERY

State Project Number AT-02
Priority Project List 2

December 15, 2012
St. Mary Parish

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I. Introduction

The Atchafalaya delta and the Wax Lake delta formed in the shallow Atchafalaya Bay between the mouth of the Atchafalaya River navigation channel and the Point au Fer shell reef (Curole, 2003). The Atchafalaya River has been a distributary of the Mississippi River since the 1500's and is typical of diversion or capture of mainstream flow by distributary (van Heerden and Roberts, 1980). In 1960, the Old River control structure was completed by the U.S. Corps of Engineers (USACE) and has since maintained the flow of the Atchafalaya River at the historic rate of 30% of the combined flow of the Mississippi and Red Rivers (Louisiana Coastal Wetlands Conservation and Restoration Task Force, 1993). A sub-aqueous delta began to form at the mouth of the Atchafalaya River between 1952 and 1962 with the introduction of silts and fine sands to the bay. Prior to 1952 the lakes and bays within the Atchafalaya Basin floodway system, north of the Atchafalaya Delta, filled with sediment. Only pro-delta clay deposition was occurring in the Atchafalaya Bay due to contact with higher salinity waters (Louisiana Coastal Wetlands Conservation and Restoration Task Force, 1993). From 1962 to 1972, coarser materials began to be deposited into the bay and a period of distal bar and sub-aqueous bar accretion occurred (van Heerden and Roberts, 1980). The spring flood of 1973 produced the first sub-aerial growth of the Atchafalaya Delta on both sides of the navigation channel (van Heerden et. al., 1991).

The Atchafalaya Delta is bisected by the Lower Atchafalaya River navigation channel, which is maintained by the USACE for navigational purposes. Dredge material on the channel banks and increased channel depth have created unnatural conditions forming an efficient conduit for river sediment transportation to the Gulf of Mexico, depriving the adjacent delta environments of sediments critical to the delta-building process. Also, distributary channels in the eastern portion of the Atchafalaya delta have undergone large reductions in cross-sectional area and flow efficiency, further reducing sediment to the delta lobes (van Heerden and Roberts, 1980).

The Atchafalaya Sediment Delivery Project (AT-02) is a distributary channel maintenance and delta lobe creation project consisting of approximately 2,182 acres of freshwater wetlands and shallow open water. The project is located in the northeastern region of the Atchafalaya Delta within the Louisiana Department of Wildlife and Fisheries Atchafalaya Delta Wildlife Management Area in the southeast corner of St. Mary Parish, Louisiana. The project is bounded on the north by Mile Island, the west by East Pass, and to the east and south by the Atchafalaya Bay (Monitoring Plan, 2003). The Atchafalaya Sediment distributary features include two tertiary channels (Natal Channel and Castille Pass) located on the east side of East Pass, the secondary distributary channel on the eastern side of the Atchafalaya delta. A map of the project boundary and features are shown in Appendix A. The objective and specific goals of the project according to the Monitoring Plan prepared by the Coastal Protection and Restoration Authority (CPRA) are outlined below:

Project Objectives:

1. Restore Natal Channel and Castille Pass to functioning tertiary distributary chanels thereby enhancing the system's natural delta-building potential.
2. Utilizing dredge material from the dredging of Natal Channel and Castille Pass to create delta lobe islands suitable for establishment of emergent marsh.

Specific goals:

1. To increase the distributary potential of Natal Channel and Castille Pass by increasing their cross-sectional area and length.
2. Create approximately 230 acres of delta lobe islands through the beneficial use of dredge material at elevations suitable for emergent marsh vegetation.
3. Increase the rate of subaerial delta growth in the project area to that measured from historical photographs since 1956.
4. Increase frequency of occurrence of submerged aquatic vegetation.

II. Inspection Purpose and Procedures

The purpose of the annual inspection of the Atchafalaya Sediment Delivery Project (AT-02) is to evaluate the constructed project features, identify any deficiencies and prepare a report detailing the condition of such features and to recommend corrective actions needed, if any. Should it be determined that corrective actions are needed, CPRA shall provide, in report form, a detailed cost estimate for engineering, design, supervision, inspection, construction contingencies, and an assessment of the urgency of such repairs. The annual inspection report also contains a summary of maintenance projects undertaken since the constructed features were completed and an estimated project budget for the upcoming three (3) years for operation, maintenance and rehabilitation. The three (3) year projected operation and maintenance budget is shown in Appendix C. A summary of past operation and maintenance projects undertaken since the completion of the Atchafalaya Sediment Delivery Project (AT-02) are outlined in Section IV of this report.

An inspection of the Atchafalaya Sediment Delivery Project (AT-02) was held on April 9, 2012 under clear skies and mild temperatures. In attendance were Brian Babin and Adam Ledet of the CPRA, Dr. John Foret of the National Marine Fisheries Service (NMFS) and Edmond Mouton and Tyson Croch with the Louisiana Department of Wildlife and Fisheries (LDWF). The attendees met at the Berwick Public Boat Launch in St. Mary Parish. The inspection began at approximately 10:30 a.m. and ended at 12:30 p.m.

The field trip included a visual inspection of adjacent marsh and limited soundings of Natal and Castille Pass using a hand-held fathometer. The primary sources of information and elevation data used in this report are from the 2008 Topographic and Bathymetric Surveys performed by Morris P. Hebert, Inc. and the 2009 Operations, Maintenance, and Monitoring Report prepared by Mr. Glen Curole of CPRA.

III. Project Description and History

The Atchafalaya Delta is bisected by the Lower Atchafalaya River which is maintained by the U.S. Corps of Engineers to an elevation of -20.0 ft. NGVD with a 400 foot bottom width for navigation purposes. The continued dredging and placement of spoil material along the banks of the river has caused sediment deprivation in adjacent delta environments.

The Atchafalaya Sediment (AT-02) project was constructed under the Coastal Wetlands, Planning, Protection, and Restoration Project (CWPPRA) with the Coastal Protection and Restoration Authority as the local state sponsor and the National Marine Fisheries Service of the Department of Commerce as the federal sponsor. The general contractor performing the construction of the Atchafalaya Sediment (AT-02) and Big Island projects (AT-03), which was accomplished under one contract by the State of Louisiana Division of Administration, and administered by the Louisiana Department of Natural Resources (LDNR) was River Road Construction Co. of Mandeville, LA. The Atchafalaya Sediment Delivery Project (AT-02) and the Big Island Mining Project (AT-03) were constructed during the period of January 28, 1998 and October 27, 1998. Final cost of the construction contract for both projects was $7,238,449.36. The design, engineering, and construction oversight for this project was performed by Brown, Cunningham, and Gannuch Engineers under an engineering services contract with LDNR.

The principle project features of the Atchafalaya Sediment Delivery (AT-02) project include:

- Natal Channel – 5,100 linear ft. dredged channel with a 200 ft. bottom width and a smaller 1,500 linear ft. branch channel oriented to the northeast from Station 74+00. The bottom width of this branch channel was 150 ft.
- Castille Pass – 2,000 linear ft. dredged channel with a 125 ft. bottom width.
- Marsh Creation – approximately 668,683 cubic yards of dredge material from Natal Channel placed at four (4) different sites creating approximately 257 acres of wetlands.
- Marsh Creation – approximately 32,242 cubic yards of dredge material from Castille Pass placed at a location southeast of the pass creating approximately 20.5 acres of wetlands.

IV. Summary of Past Operation and Maintenance Projects

Since the completion of the Atchafalaya Sediment Delivery (AT-02) Project in March 1998, there were no maintenance dredging or marsh creation efforts proposed or undertaken. As recommended in the 2005 Annual Inspection Report, a complete survey of all dredged channels and marsh fill areas was completed in the spring of 2008 by Morris P. Hebert, survey consultant contracted by the Coastal Protection and Restoration Authority.

V. Inspection Results

Inspection of the Atchafalaya Sediment Project (AT-02) began at the head of Natal Channel near East Pass where significant shoaling was observed creating a sand bar at the entrance to the channel. From survey data collected in the spring 2008, we found that the "sand bar" begins near Station 15+00 on the left descending bank of Natal Channel and encompasses the entire section of the original constructed dredge channel. As the existing channel filled in, a smaller channel developed along the right descending bank. At the time of the 2008 survey, the smaller channel was approximately 100' wide with depths ranging between -7.0' to -10.0' NAVD. Depth measurements during the 2012 inspection revealed average depths of 9.0' in the channel at the mouth of Natal Chanel. Traveling downstream, the 2008 survey revealed a smaller 100' wide smaller channel proceeding along the right descending bank of Natal Channel to Station 45+00 near the bend around Ivor Island. As the channel meandered around the bend of Ivor Island near Station 50+00, the channel began to transition towards the left descending bank between Stations 50+00 to 65+00. The bottom width of the channel in this area was smaller (approximately 25' bottom width) and the bottom elevations average -10.0' NAVD. In 2008, the south leg of remaining channel past the "fork" between Stations 70+00 and 88+00 was completely shoaled in with average elevations around 0.0' NAVD. Prior to 2003, this was not the case. The 2003 inspection revealed that water depths in the south reach of Natal Channel was between -6.0' to -6.5' for quite a distance below the fork on the left indicating that the water flow in the channel was adequate enough to scour pass the location where the initial dredging had ended. This would indicated that at some point after 2003, the majority of water flow through the south leg of Natal Channel was reduced significantly due to a reduction in flow the main Natal Channel or diverted through the east reach or "left fork" near Sta. 70+00. The 'left fork" is a 1,500 linear foot section of Natal Channel along the southern boundary of Teal Island. In 2008, the channel depths along the left fork, south of Teal Island, ranged between -8.0 at Station 0+00 and -10.0 at Station 15+00. Based on current and previous observations in the field, we believe that the condition of Natal Channel is similar to conditions found in 2008 with possible narrowing of the main channel causing a reduction in flow to the southern reaches of the project area. Without current bathymetric data, it is difficult to determine if there were significant changes in channel contours since the 2008.

Further analysis of the 2008 bathymetric data confirmed that Natal Canal is experiencing channel narrowing and modifications to its channel morphology partially due to reoccupation of a former distributary (Curole G. and Babin B., 2010 OM&M Report). Natal Channel is not capturing enough of the East Pass discharge to prevent large scale shoaling and channel narrowing (DuMars 2002, Letter et. Al. 2008; Roberts and van Heerden 1992; Mashriqui 2003) Bathymetric data provides evidence showing that Natal Channel is diverting flow to a former distributary (NE Diversion) located north of the bifurcation (Roberts and van Heerden 1992; van Heerden and Roberts 1980; van Heerden and Roberts 1988; van Heerden et al. 1991) contributing to the aggradation downstream of the diversion. In the future, Natal Channel may abandon the constructed bifurcated channels and reoccupy its former course through the NE Diversion (OM&M Plan).

Inspection of the Castille Pass Channel began at the mouth near East Pass and proceeded downstream towards the bay. The water depths at the mouth of Castille Pass at the time of the inspection were approximately 8.0'. The CRMS gage in Castille Pass indicated that the water levels were at 1.98' NAVD. An analysis of the historic data and past bathymetric surveys revealed that the Castille Pass Channel experienced the least shoaling and maintained the deepest contours of the two channels (Castille Pass and Natal Channel) (Curole, G. and Babin, B., 2010 OM&M Plan). Castille Pass has also aggraded to its pre-construction contours and volumes signifying that the Castille Pass Channel discharge rate is in equilibrium with its flow field and sediment load (DuMars 2002; Letter et al 2008; Mashriqui 2003; Edmonds and Slingerland 2007; Edmonds and Slingerland 2008).

VI. Conclusions and Recommendations

From a limited visual inspection, historic analysis and bathymetric data collected in 2008, the Acthafalaya Sediment Delivery (AT-02) project did exhibit disproportional shoaling in both channels from 1998 to present. From the 2008 bathymetric data, the most severe sediment accumulation was found at the head of East Pass and along Natal Channel from the beginning of the right "fork" to Tiger Pass (Sta. 75+00 to Sta. 88+00). Although shoaling is an obvious problem, there are small visual benefits with delta lobe development near the end of Natal Channel south of Teal Island which indicates that sediment transport via Natal Channel is occurring. In the case of Castille Pass, the flow field, channel section and length appears to have aggraded to its pre-construction condition.

As outlined in the 2010 Operations, Maintenance and Monitoring report, of the project goals set for the project, two (2) have been attained and the third (3^{rd}) was partially attained. The first goal to increase the distributary potential by increasing the cross-sectional area and length of Natal Chanel and Castille Pass Channel has been partially met. The creation and enlargement of the delta lobe at these locations indicate that the delta is growing. Although delta growth is noticeable, extensive shoaling and the narrowing of Natal Channel since construction of the project and the stabilized nature of Castille Pass has adversely affected the continued distributary potential of both channels (Curle G. Babin, B., 2010 OM&M). The second goal was to create approximately 230 acres of delta lobe islands by beneficially using dredge material from channel excavation to create marsh to elevations suitable for the growth of emergent vegetation. This goal was achieved since a total of 249 acres of marsh was created at five (5) disposal areas.

Based on the anticipated benefits in the Wetland Value Assessment (WVA), it was estimated that approximately 1,900 acres of new marsh would accrete over a 20 year period as a consequence of natural delta building associated with the construction of Natal Channel and Castille Pass (NMFS,1992). The consensus of the review committee for the adaptive management process completed in 2002 revealed that the expectations of naturally building 95 acres of emergent marsh per year are somewhat questionable and likely will not be met (Raynie and Visser, 2002).

In order to assess the extent of shoaling that has taken place in Natal Channel and Castille Pass since 2008, we are recommending another bathymetric survey of both channels. Once this survey data is collected and evaluated, an informed decision as to the benefits of re-dredging Natal Channel and Castille Pass can be made. Although there are limited O&M funds available for hydraulic dredging, there may be areas in these channels that may benefit from mechanical dredging to re-open the most critical areas of shoaling.

References:

Curole, 2003. Monitoring Plan, Atchafalaya Sediment Delivery (AT-02). State of Louisiana, Department of Natural Resources, Coastal Engineering Division. 14 pp.

DuMars, A. J. 2002. Distributary Mouth Bar Formation and Channel Bifurcation in the Wax Lake Delta, Atchafalaya Bay, Louisiana. MS Thesis, Louisiana State University 45 pp.

Edmonds, D. A. and R. L. Slingerland. 2007. Mechanics of River Mouth Bar Formation: Implications for the Morphodynamics of Delta Distributary Networks. Journal of Geophysical Research 112: 1-14.

Edmonds, D. A. and R. L. Slingerland. 2008. Stability of Delta Distributary Networks and Their Bifurcations. Water Resources Research 44: 1-13.

Louisiana Coastal Wetlands Conservation and Restoration Task Force 1993. Louisiana Coastal Wetlands Restoration Plan. Atchafalaya Basin Plan. Appendix F. 63pp.

Mashriqui, H. S. 2003. Hydrodynamic and Sediment Transport Modeling of Deltaic Sediment Processes. Ph.D. Dissertation, Louisiana State University 146 pp.

R. Raynie., Dr. J. Visser 2002. CWPPRA Adaptive Management Review Final Report. Prepared for the CWPPRA Planning and Evaluation Subcommittee, Technical Committee, and Task Force. 50pp.

Roberts, H.H. and I.L. van Heerden. 1992. The Atchafalaya Delta: An analog for thin deltas and subdeltas in the subsurface. Basin Research Institute Bulletin 2: 31-42.

U.S. Department of Commerce, National Marine Fisheries Service 1992: Re-Establishment of Natural Sediment Delivery Systems, Atchafalaya Delta, Atchafalaya Basin PAT-2, Wetland Value Assessment (WVA).

van Heerden, I.L., and H. H. Roberts 1980. The Atchafalaya Delta: Rapid progradation along a tranditionally retreating coast (South-Central Louisiana). Z. Geomorph. N. F. Suppl.-Bd. 34. 188-201.

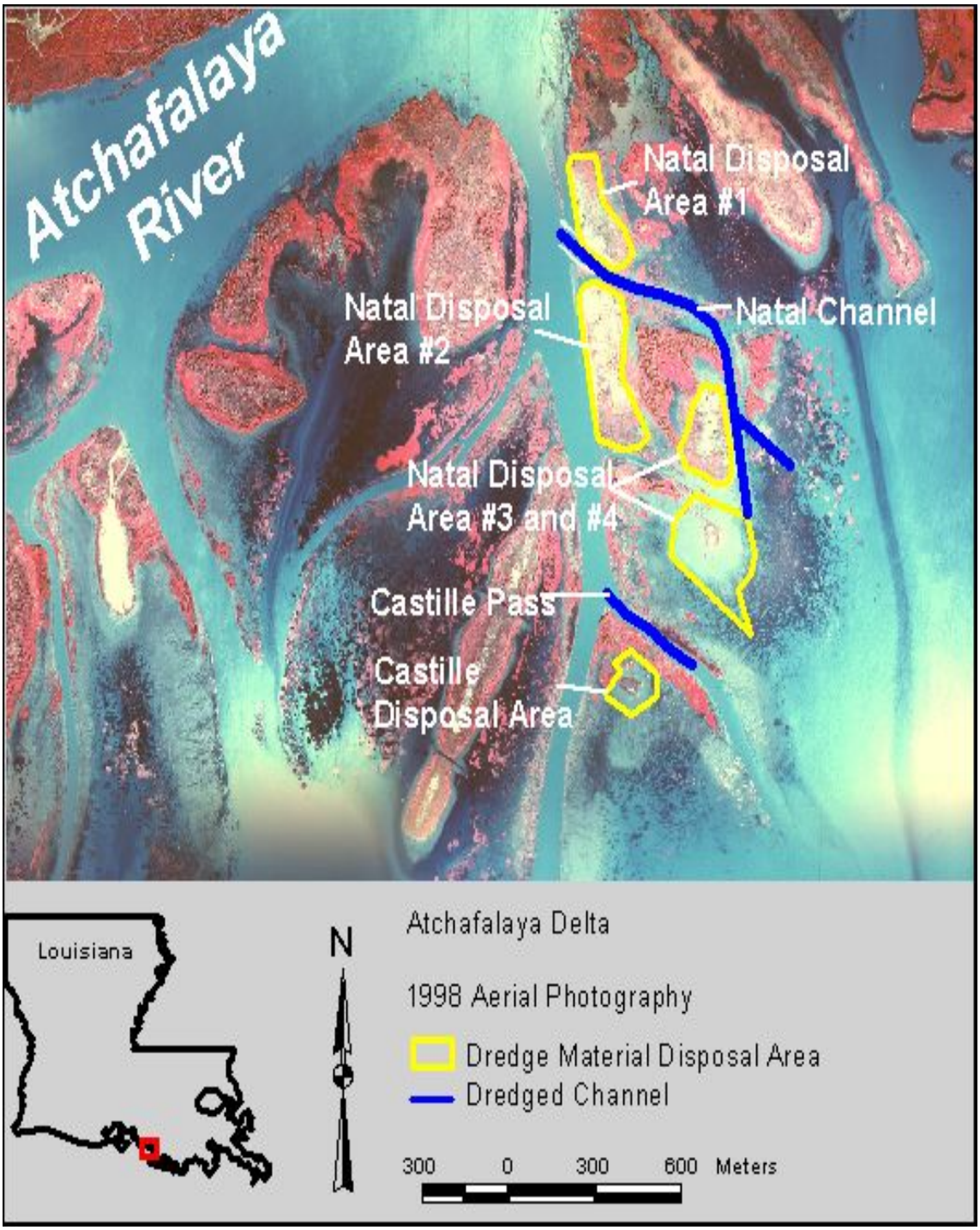
van Heerden, L. I. and H. H. Roberts. 1988. Facies Development of Atchafalaya Delta, Louisiana: A Modern Bayhead Delta. American Association of Petroleum Geologist Bulletin 72(4): 439-453.

van Heerden, H. H. Roberts, S. Penland, and R. H. Cunningham 1991. Subaerial delta development, eastern Atchafalaya Bay, Louisiana. Proceedings of GCS-SEP 12th Annual Meeting. 13 pp.

Curole, G. P. and B. J. Babin. 2010. 2010 Operations, Maintenance, and Monitoring Report for Atchafalaya Sediment Delivery (AT-02), Coastal Protection and Restoration Authority of Louisiana, Office of Coastal Protection and Restoration, Thibodaux, Louisiana. 38 pp.

Appendix A

PROJECT FEATURES MAP


Atchafalaya River
Natal Disposal Area #1
Natal Channel
Natal Disposal Area #2
Natal Disposal Area #3 and #4
Castille Pass
Castille Disposal Area
Louisiana
N
Atchafalaya Delta
1998 Aerial Photography
Dredge Material Disposal Area
Dredged Channel
300 0 300 600 Meters

Appendix B

PHOTOGRAPHS

Photo 6124 – view of Natal Channel looking downstream from the mouth near East Pass.

Photo 6125 – view of the northeast diversion channel from Natal Channel.

Photo 6126 – view of Natal Channel south of the NE Diversion channel looking downstream.

Photo 6127 – view near the end of Natal Channel .

Photo 6128 – view of marsh adjacent to Natal channel.

Photo 6129 – view of deltaic features near the end of Natal Channel.

Photo 6130 – view of deltaic features at the end of Natal Channel.

Photo 6131 – view of the deltaic island created at the end of Natal Channel.

Photo 6132 - view of the deltaic island created at the end of **C**astille Pass.

Photo 6133 - view of the deltaic island created at the end of **C**astille Pass.

Appendix C

Three (3) Year Budget Projections

ATCHAFALAYA SEDIMENT DELIVERY PROJECT (AT-02)

Three-Year Operations & Maintenance Budgets 07/01/2012 - 06/30/2015

Project Manager	O & M Manager	Federal Sponsor	Prepared By
	Brian Babin	*NMFS*	*Brian Babin*

	2012/2013	2013/2014	2014/2015
Maintenance Inspection	$ 2,814.00	$ -	$ 2,985.00
Structure Operation	$ -	$ -	$ -
Administration	$ 3,000.00		$ -
Maintenance/Rehabilitation			

12/13 Description: Batymetric survey of Natal Channel and Castille Pass

E&D	$ 16,560.00
Construction	$ -
Construction Oversight	$ -
Sub Total - Maint. And Rehab.	$ 16,560.00

13/14 Description: Allowance for Maintenance Dredging by Landowner (LDWF)

E&D	$ 5,000.00
Construction	$ 300,000.00
Construction Oversight	$ 20,000.00
Sub Total - Maint. And Rehab.	$ 325,000.00

14/15 Description:

E&D	$ -
Construction	$ -
Construction Oversight	$ -
Sub Total - Maint. And Rehab.	$ -

	2012/2013	2013/2014	2014/2015
Total O&M Budgets	**$ 22,374.00**	**$ 325,000.00**	**$ 2,985.00**

Total O&M Budget 2012 through 2015	**$350,359**
Unexpended O&M Budget	**$399,493**
Remaining O&M Budget (Projected)	**$49,134**

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OPERATIONS & MAINTENANCE BUDGET WORKSHEET

Project: Atchafalaya Sediment Delivery Project (AT-02)

FY 12/13 –

Administration		$ 3,000
O&M Inspection & Report		$ 2,814
Operation:		$ 0
Maintenance:		$ 16,560
E&D:	$ 16,560	
Construction:	$	
Construction Oversight:	$	
General Maintenance:	$	

Operation and Maintenance Assumptions:
Biennial Inspection (2012/2013) - $2,652

2012 Bathymetric Survey:
Survey Crew: 36 hours @ $125/hr = $4,500
Boat: 3 days @ $600/day = $1,800
Equipment: 3 days @ $500/day = $1,500
Data Processing/Report: = $5,000
$13,800
(20% Contingency) $ 2,760
Total: $16,560

FY 13/14 –

Administration		$ 0
O&M Inspection & Report		$ 0
Operation:		$ 0
Maintenance:		$325,000
E&D:	$ 5,000	
Construction:	$300,000	
Construction Oversight:	$ 20,000	

Operation and Maintenance Assumptions:
Maintenance Dredging of Natal Channel – Included in year 13/14 is a lump sum of $300,000 for planning, permitting and dredging of Natal Channel should the landowner agree perform this work. OCPR administration costs for planning and construction oversight of maintenance dredging is estimated to be approximately $5,000* and $20,000***, respectively.

FY 14/15 –

Administration		$ 0
O&M Inspection & Report		$ 2,985
Operation:		$ 0
Maintenance:		$ 0
E&D:	$ 0	
Construction:	$ 0	
Construction Oversight:	$ 0	

Operation and Maintenance Assumptions:
Biennial Inspection (2014/2015) – (2,814 x 6% = $2,985)

2012-2015 Accounting

Unexpended funds from Lana Report:	$ **411,605.61**
Expenditures by LDNR:	$ 12,112.83
Estimated Unexpended Funds:	$ 399,492.78