APPENDIX K:
Economics Appendix
Benefit / Cost – Incremental Cost Analysis

Volume III
APPENDIX K:
Economics
Cost Effectiveness & Incremental Cost Analysis

Appendix K1 –Table of Contents

1.0 PURPOSE

The purpose of this appendix is to describe the process by which alternatives for the LCA - ARTM were developed and incrementally compared. A Cost Effectiveness & Incremental Cost Analysis (CE/ICA) model (1) was utilized to evaluate and compare benefits and costs for each Alternative.

1.1 ALTERNATIVE PLANS

1.1.1 Description of Alternative Plans

Conceptual alternatives were integrated with the suitable locations for diversion structures to yield an array of alternatives that meet the goals and objectives of the project and are likely to restore the impaired deltaic processes. The alternatives are:

Alternative 1 - No Action (Future without Project Condition)
This alternative includes no measures from this project. The future without project condition will include sea level rise, subsidence, and other projects that are under construction or are likely to be constructed.

Alternative 2 - Strategy: Utilize Existing Flow and Management Measures.
This alternative redistributes existing freshwater to benefit Terrebonne marshes using a variety of measures. To achieve this, Gulf Intracoastal Waterway (GIWW) constrictions would be eliminated. Additionally, the following measures to restrict increase, and control water are proposed for each of the three subunits. In the West – Bayou Penchant Area, culverts, dredging, bank protection, a sediment plug, and a weir will be utilized. In the Central – Lake Boudreaux Area, culverts, levees, dredging, marsh terraces and berms, sediment plugs, modified operation of the future HNC (Harbor Navigation Canal) lock complex, and a large sluice gated box culvert are proposed. In the East – Grand Bayou Area, culverts, dredging, gaps in canal spoil banks, marsh berms, sediment plugs, and removal of a weir and soil plug.

Alternative 3 - Strategy: Increase Atchafalaya River Flows and Management Measures.
This alternative will increase Atchafalaya River inflows and redistribute existing freshwater. Thus, Alternative 3 includes all the measures in Alternative 2 and three additional. All three measures are in the West – Bayou Penchant Area. To increase flows from the Atchafalaya River to the GIWW, water will be moved from Bayou Shaffer to the Avoca Island Cutoff/Bayou Chene. This will be accomplished by creating an opening through Avoca Island and installing a large gated diversion structure (WS4) in the opening. The remaining two measures (WO1 and WO2) would place stone along the shore of Bayou Chene and Avoca Island Cutoff to protect from increased flows.

Alternative 4 - Strategy: Increase Flow from East of the Project Area and Management Measures.
This alternative will increase freshwater flows from east of the project area and redistribute existing freshwater. Thus, Alternative 4 includes all but one of the measures in Alternative 2,

(1) IWR-Planning Suite Model, version 2.0.1.0 Beta: Corps-certified.

and has two additional measures. Alternative 4 varies from Alternative 2 by the measures in the East – Grand Bayou Area. In Alternative 2, a bridge with Obermeyer gates (EC5) is proposed to connect the GIWW to Grand Bayou under Hwy 24. In Alternative 4, this measure is replaced by a pump station (ES2). This pump station would increase freshwater delivery to the Grand Bayou watershed but not the other subunits. The second new measure is a soil plug (EP8) in Bayou L'eau Bleu. Bayou L'eau Bleu connects the canal receiving the pump station outflow to the GIWW. The pump station is pumping water from the GIWW, thus the soil plug is necessary to prevent recirculation of water.

Alternative 5 - Strategy: Increase Flow from the East and from the Atchafalaya River and Management Measures.
This alternative will increase flows from the east and west and redistribute existing freshwater. This alternative is a combination of Alternatives 3 and 4. The only measure in Alternative 3 not within this alternative is the Hwy. 24 Bridge with Obermeyer gates (EC5) which is replaced by a pump station (ES2), as in Alternative 4.

Alternative 6 - Strategy: Increase Atchafalaya River Flow and Management Measures.
This alternative will increase Atchafalaya River inflows and improve the passage of freshwater through the GIWW while slowing water passage to the gulf through the HNC. Alternative 6 differs from Alternative 3, because Alternative 6 only includes water management measures along the GIWW. The measures to increase Atchafalaya River inflows are the same as Alternative 3. A large gated diversion structure (WS4) would be placed in the new opening created in Avoca Island. Shoreline protection would be placed (WO1 and WO2) in Bayou Chene and Avoca Island Cutoff. To improve freshwater flows through the GIWW to Grand Bayou, the following measures from Alternative 2 are proposed. In East – Grand Bayou Area, dredging is proposed to connect Grand Bayou to the GIWW (ED5) and enlarge Grand Bayou (ED3). In Central – Lake Boudreaux Area, the GIWW is constricted as it passed under Hwy. 24. The Hwy. 24 bridge columns do not allow for channel enlargement. Therefore dredging a secondary channel is proposed with two culverts; one under each Hwy. 24 bridge. Modifying the operation of the HNC Lock Complex is also included in this alternative.

Alternative 7 - Strategy: Utilize Existing Flow and Management Measures.
This alternative will slow the movement of freshwater to the Gulf of Mexico and thus put additional freshwater onto northern Terrebonne marshes. The one measure in this alternative is modified operation of the proposed HNC Lock Complex (CL1). The HNC Lock Complex is part of the proposed U.S. Army Corps of Engineers Morganza to the Gulf project for flood risk management. The Lock Complex includes a set of navigable sector gates. Under normal operation, the navigable sector gates would remain open with unrestricted vehicle passage and closed during storm events and when the Atchafalaya River is low. This alternative proposes to keep the sector gates closed more frequently to hold water back thus moving freshwater onto northern marshes. When the sector gates are closed boat traffic would travel through the lock chambers. As part of this alternative, an industry traffic management system would be developed for vessels exceeding the lock size that will require the sector gates to be opened.

Alternative 8 - Strategy: Utilize Existing Flow and Management Measures
This alternative redistributes existing freshwater to benefit eastern and central Terrebonne marshes using a variety of measures. This alternative represents an increment between Alternative 7 and Alternative 2 and contains many of the features of Alternative 2. In the Central – Lake Boudreaux Area, culverts, levees, dredging, marsh terraces and berms, sediment plugs, modified operation of the future HNC (Houma Navigation Canal) lock complex, and a large sluice gated box culvert are proposed. In the East – Grand Bayou Area, culverts, dredging, gaps in canal spoil banks, marsh berms, sediment plugs, and removal of a weir and soil plug are proposed.

1.1.2 Assessment Methods

Wetland Value Assessment

The Wetland Value Assessment (WVA) methodology is a quantitative habitat-based assessment methodology developed for use in determining wetland benefits of project proposals submitted for funding under the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA). The WVA quantifies changes in fish and wildlife habitat quality and quantity that are expected to result from a proposed wetland restoration project. The results of the WVA, measured in Average Annual Habitat Units (AAHUs), can be combined with cost data to provide a measure of the effectiveness of a proposed project in terms of annualized cost per AAHU gained. In addition, the WVA methodology provides an estimate of the number of acres benefited or enhanced by the project and the net acres of habitat protected/restored. Additional explanation of the WVA methodology can be found in Section 3.5.2 of the Main Report.

Habitat variables considered appropriate for describing habitat quality in each wetland type were selected according to the following criteria:

- The condition described by the variable had to be important in characterizing fish and wildlife habitat quality in the wetland type under consideration;

- Values had to be easily estimated and predicted based on existing or readily obtainable data (e.g., aerial photography, habitat classification data, water quality monitoring stations, interviews with knowledgeable individuals, etc.); and

- The variable had to be sensitive to the types of changes expected to be brought about by typical wetland restoration projects proposed under the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA).

Habitat Suitability Index

A habitat suitability index graph is a graphical representation of how fish and wildlife habitat quality or "suitability" of a given habitat type is predicted to change as values of the given variable change, and allows the model user to numerically describe, through a Suitability Index, the habitat quality of a wetland area for any variable value. Each Suitability Index ranges from 0.1 to 1.0, with 1.0 representing the optimal condition for the variable in question. Suitability Index (SI) graphs are constructed for each variable. The final step in model development was to construct a mathematical formula that combines all Suitability Indices into a single Habitat Suitability Index (HSI) value. Because the Suitability Indices range from 0.1 to 1.0, the HSI also ranges from 0.1 to 1.0, and is a numerical representation of the overall or "composite" habitat quality of the particular wetland area being evaluated. The HSI formula defines the aggregation of

Suitability Indices in a manner unique to each wetland type depending on how the formula is constructed.

Benefit Assessment

The net benefits of a proposed project are estimated by predicting future habitat conditions under two scenarios: future without-project and future with-project. Specifically, predictions are made as to how the model variables will change through time under the two scenarios. Through that process, HSIs are established for baseline (pre-project) conditions and for future without- and future with-project scenarios for selected "target years" throughout the expected life of the project. Those HSIs are then multiplied by the study area acreage at each target year to arrive at Habitat Units (HUs). Habitat Units represent a numerical combination of quality (HSI) and quantity (acres) existing at any given point in time. The HUs resulting from the future without- and future with-project scenarios are annualized, averaged over the project life, to determine Average Annual Habitat Units (AAHUs). The "benefit" of a project can be quantified by comparing AAHUs between the future without- and future with-project scenarios. The difference in AAHUs between the two scenarios represents the net benefit attributable to the project in terms of habitat quantity and quality.

Based on the WVA process AAHUs were calculated for each of the alternatives. The Net AAHUs generated for each Alternative are presented in Table K1.

Table K1: LCA-ARTM Benefits

Alternative	Net AAHUs
Alt. 1 (No Action)	N/A
Alt. 2	3,219.90
Alt. 3	3,325.45
Alt. 4	4,257.59
Alt. 5	4,718.61
Alt. 6	775.77
Alt. 7	243.20
Alt. 8	1,214.19

1.1.3 Cost Estimation

First Cost Construction

The CE/ICA process using IWR Suite is employed to further refine the preliminary alternatives. The first step involves developing preliminary cost estimates for each alternative. Items included in the first cost construction estimates include mobilization, dredging, placement, demobilization, contingency, Engineering and Design during Construction (EDC), Supervision & Administration (S&A), and Real Estate.

OMRR&R Costs

Operation, maintenance, repair, rehabilitation and replacement (OMRR&R) costs are also estimated for each alternative, compiling appropriate annual, 5-year and 10-year OMRR&R costs for each alternative.

Monitoring Cost

Annual monitoring cost, estimated at $1,005,000, is included for Alternatives 2 through 8. For Alternatives 2, 3, 4, 5, 6, and 8, monitoring cost would be incurred annually for the first decade of the project life cycle, starting in year 2013. However, for Alternative 7, monitoring cost would be incurred annually for the second decade of the project life cycle, starting in year 2023.

All first costs, OMRR&R costs and monitoring costs are present-valued to the beginning of the period of analysis (project life cycle), and amortized at the Fiscal Year (FY) 2010 federal discount rate of 4.375 percent over the 50-year period of analysis, in order to develop equivalent average annual (annualized) cost. Table K2 summarizes these annualized costs associated with each alternative.

Table K2: LCA-ARTM: Step 1 Alternative Costs

Alternative	First Cost*	Annualized First Cost**	Annualized Monitoring Cost**	Annualized OMRR&R**	**Total Annualized Investment Cost**
Alt. 1 (No Action)	N/A	N/A	N/A	N/A	N/A
Alt. 2	$203,047,200	$10,066,504	$396,686	$72,514	$10,535,704
Alt. 3	$232,041,000	$11,503,935	$396,686	$75,889	$11,976,509
Alt. 4	$253,038,800	$12,544,946	$396,686	$1,656,894	$14,598,526
Alt. 5	$294,899,600	$14,620,286	$396,686	$1,660,269	$16,677,241
Alt. 6	$134,199,000	$6,653,206	$396,686	$10,175	$7,060,066
Alt. 7	$42,000	$2,082	$258,513	$0	$260,595
Alt. 8	$86,777,600	$4,302,187	$396,686	$48,684	$4,747,557

*Includes Real Estate and Cultural Resources
**Discount Rate: 4-3/8%

1.2 COST EFFECTIVENESS (CE)

1.2.1 Alternatives Removed from Further Consideration

At this point in the analysis, Alternatives 4 and 5 (underlined above in Table K2) are removed from consideration prior to performing the CE/ICA. At the TSP meeting, it was determined Alternatives 4 and 5 were not sustainable from an efficiency or acceptability standpoint. These alternatives required a large 4,000 cfs pumping station at the confluence of the GIWW and Grand Bayou. The large pump station adversely impacted the isohalines in the Barataria basin and would have forced salt water intrusion up into Bayou Lafourche. The interagency team determined that these were unacceptable adverse environmental impacts and precluded the alternatives from further consideration and analysis. The effects of this pumping station do not conform to the USACE Environmental Operating Principles concerning sustainability.

1.2.2 Screening/Evaluation of Alternatives

Prior to identifying cost effective alternatives, all five remaining alternatives (Alternatives 2, 3, 6, 7, and 8) are sorted by Total AAHUs (average annual output level), from lowest to highest. After sorting by Total AAHUs, any non-cost effective alternatives are identified as either *Inefficient in Production* or *Ineffective in Production*. These steps identify the least-cost alternative for every level of output under consideration. *Inefficient in Production* is defined as any Alternative where the same output level can be generated at a lesser cost by another alternative. The alternatives are evaluated and wherever there are two or more Alternatives providing the same output level, aside from any other considerations (i.e., uncertainty about the reliability of cost or output estimates), the more costly alternative(s) generating that same output level is eliminated as *Inefficient in Production*. Next, any alternatives that are *Ineffective in Production* are identified. *Ineffective in Production* is defined as any alternative where a greater output level can be generated at a lesser or equal cost by another alternative.

With the alternatives still sorted by output level (AAHUs), a pair-wise comparison of output level and average annual cost is made for all remaining Alternatives that ‘passed’ the *Inefficient in Production* screening in the previous step. The alternatives are again evaluated and any alternative generating less output at an equal or greater cost is eliminated as *Ineffective in Production*. Noting Table K3, Alternative 6 generates less output (AAHUs) than Alternative 8, (780.20 < 1,214.19). However, Alternative 6 has a greater average annual cost than Alternative 8, ($5,792,824 > $4,747,577), and thus Alternative 6, in italics, is identified and eliminated as being *Ineffective in Production*. The four remaining alternatives that passed the Inefficient or Ineffective in Production screenings, Alternatives 2, 3, 6, and 7, are all cost effective alternatives. Investment costs and Net AAHUs for these remaining cost effective alternatives are presented in Table K4, sorted by Net AAHUs.

Table K3: LCA-ARTM: Step 2

Alternative	Average Annual Cost	Net AAHUs	Average Annual Cost Per Unit (AAHU)	Non-Cost Effective Alternatives
Alt. 1 (No Action)	N/A	0	N/A	
Alt. 7	$260,595	243.20	$1,071.53	
Alt. 6	*$5,792,824*	*775.77*	*$7,467.19*	*Ineffective in Production*
Alt. 8	$4,747,577	1,214.19	$3,910.06	
Alt. 2	$10,535,704	3,219.90	$3,272.06	
Alt. 3	$11,976,509	3,325.45	$3,601.47	

Table K4: LCA-ARTM: Step 2

Alternative	Average Annual Cost	Net AAHUs	Average Annual Cost Per Unit (AAHU)
Alt. 1 (No Action)	N/A	0	N/A
Alt. 7	$260,595	243.20	$1,071.53
Alt. 8	$4,747,577	1,214.19	$3,910.06
Alt. 2	$10,535,704	3,219.90	$3,272.06
Alt. 3	$11,976,509	3,325.45	$3,601.47

1.3 INCREMENTAL COST ANALYSIS (ICA)

1.3.1 Incremental Cost Analysis Process

Incremental cost analysis is conducted on the remaining alternatives. This consists of several iterative steps where the incremental difference in both cost and output (AAHUs) are computed. Incremental cost is the additional cost incurred by selecting one alternative over another alternative, and is computed by subtracting the cost of one alternative under consideration from the cost of another alternative under consideration. Similarly, incremental output is the additional output generated by selecting one alternative over another alternative, and is computed by subtracting the output of one alternative under consideration from the output of another alternative under consideration. The first step is compute the incremental change in cost and incremental change in output from implementing each remaining alternative over the No Action Alternative, where the No Action Alternative is considered the baseline condition against which each remaining cost effective alternative is compared. Next, the alternative yielding the lowest incremental cost per unit over the No Action Alternative is identified. In other words, this identified alternative is the most cost effective remaining alternative for production of AAHUs over the No Action Alternative. After identifying this alternative with the lowest incremental cost per unit (i.e., the most cost efficient from a production perspective, producing output at the lowest unit cost), any alternatives (shown in *italics*) generating a lower output level are removed from further consideration in the ICA process. The eliminated alternatives are less efficient in production, producing a lower level of output at a higher incremental unit cost. For example, in Table K6, Alternative 8, in italics, is removed from further consideration in the ICA process. The remaining alternatives are further evaluated via repeated steps of this incremental ICA process, where the most cost effective remaining alternative becomes the **new** baseline condition against which each remaining cost effective alternative is compared. This iterative process continues until only the most cost effective, production efficient alternatives remain. When the most cost effective remaining alternative is the last alternative evaluated, there is no need for further incremental cost analysis; the ICA process is complete. The following steps display the progression through the ICA process, resulting in the remaining 'Best Buy' alternatives (Table K8).

Table K5: LCA-ARTM: Step 3 Baseline: No Action Plan					
Alternative	**Average Annual Cost**	**Net AAHUs**	**Average Annual Incremental Cost**	**Incremental Net AAHUs**	**Average Annual Incremental Cost per Unit (AAHU)**
Alt. 1 (No Action)	**N/A**	**0**	**N/A**	**N/A**	**N/A**
Alt. 7	**$260,595**	**243.20**	**$260,595**	**243.20**	**$1,071.53**
Alt. 8	$4,747,577	1,214.19	$4,747,577	1,214.19	$3,910.06
Alt. 2	$10,535,704	3,219.90	$10,535,704	3,219.90	$3,272.06
Alt. 3	$11,976,509	3,325.45	$11,976,509	3,325.45	$3,601.47

Table K6: LCA-ARTM: Step 4 Baseline: Last Selected Plan (Alt. 7)

Alternative	Average Annual Cost	Net AAHUs	Average Annual Incremental Cost	Incremental Net AAHUs	Average Annual Incremental Cost per Unit (AAHU)
Alt. 1 (No Action)	**N/A**	**0**	**N/A**	**N/A**	**N/A**
Alt. 7	**$269,595**	**243.20**	**$260,595**	**243.20**	**$1,071.53**
Alt. 8	*$4,747,577*	*1,214.19*	*$4,486,962*	*970.99*	*$4,621.02*
Alt. 2	**$10,535,704**	**3,219.90**	**$10,275,109**	**2,976.70**	**$3,451.85**
Alt. 3	$11,976,509	3,325.45	$11,715,914	3,082.25	$3,801.09

Table K7: LCA-ARTM: Step 5 Baseline: Last Selected Plan (Alt. 2)

Alternative	Average Annual Cost	Net AAHUs	Average Annual Incremental Cost	Incremental Net AAHUs	Average Annual Incremental Cost per Unit (AAHU)
Alt. 1 (No Action)	**N/A**	**0**	**N/A**	**N/A**	**N/A**
Alt. 7	**$260,595**	**243.20**	**$260,595**	**243.20**	**$1,071.53**
Alt. 2	**$10,535,704**	**3,219.90**	**$10,275,109**	**2,976.70**	**$3,451.85**
Alt. 3	**$11,976,509**	**3,325.45**	**$1,440,805**	**105.55**	**$13,650.45**

Table K8: LCA-ARTM: Step 6 "Best Buy" Plans

Alternative	Average Annual Cost	Net AAHUs	Average Annual Incremental Cost	Incremental Net AAHUs	Average Annual Incremental Cost per Unit (AAHU)
Alternative. 1 (No Action)	N/A	0	N/A	N/A	N/A
Alternative 7	$260,595	243.20	$260,595	243.20	$1,071.53
Alternative 2	$10,535,704	3,219.90	$10,275,109	2,976.70	$3,451.85
Alternative 3	$11,976,509	3,325.45	$1,440,805	105.55	$13,650.45

1.3.2 Results of the CE/ICA Process

As presented in Table K8, the remaining cost effective, production efficient Alternatives are known as "Best Buy" Plans. These Plans can be used to determine the desired project scale for environmental restoration planning. Characteristic of Best Buy Plans, the average annual incremental cost per unit increases for successive larger levels of incremental output (AAHUs).

Alternative 7 provides 243.20 total AAHUs at an average annual cost of $260,595, and an average annual incremental cost per unit (AAHU) of $1,071.53 for each of the 243.20 AAHUs. Alternative 2 provides 3,219.90 total AAHUs, at an average annual cost of $10,535,704, and an average annual incremental cost per unit of $3,451.85 for each of the *additional* 2,976.70 AAHUs over Alternative 7. Alternative 3 provides 3,325.45 total AAHUs at an average annual cost of $11,976,509, and an average annual incremental cost per unit of $13,650.45 for each of the *additional* 105.55 AAHUs over Alternative 2. The first best buy plan is the most efficient plan from an incremental cost per AAHU perspective. However, if a higher level of output (AAHUs) is desired than that provided by the first best-buy plan, the second best buy plan becomes the most efficient plan for producing additional output, and so on. The recommended Best Buy Plan is Alternative 2, generating 3,219.90 total AAHUs at an average annual investment cost of $10,535,704, and a first cost of $203,047,200.

Figure K1 displays the relation of Output (AAHUs) to Average Annual Cost, while Figure K2 displays the relation of Output (AAHUs) to Incremental Cost per Unit (AAHU).

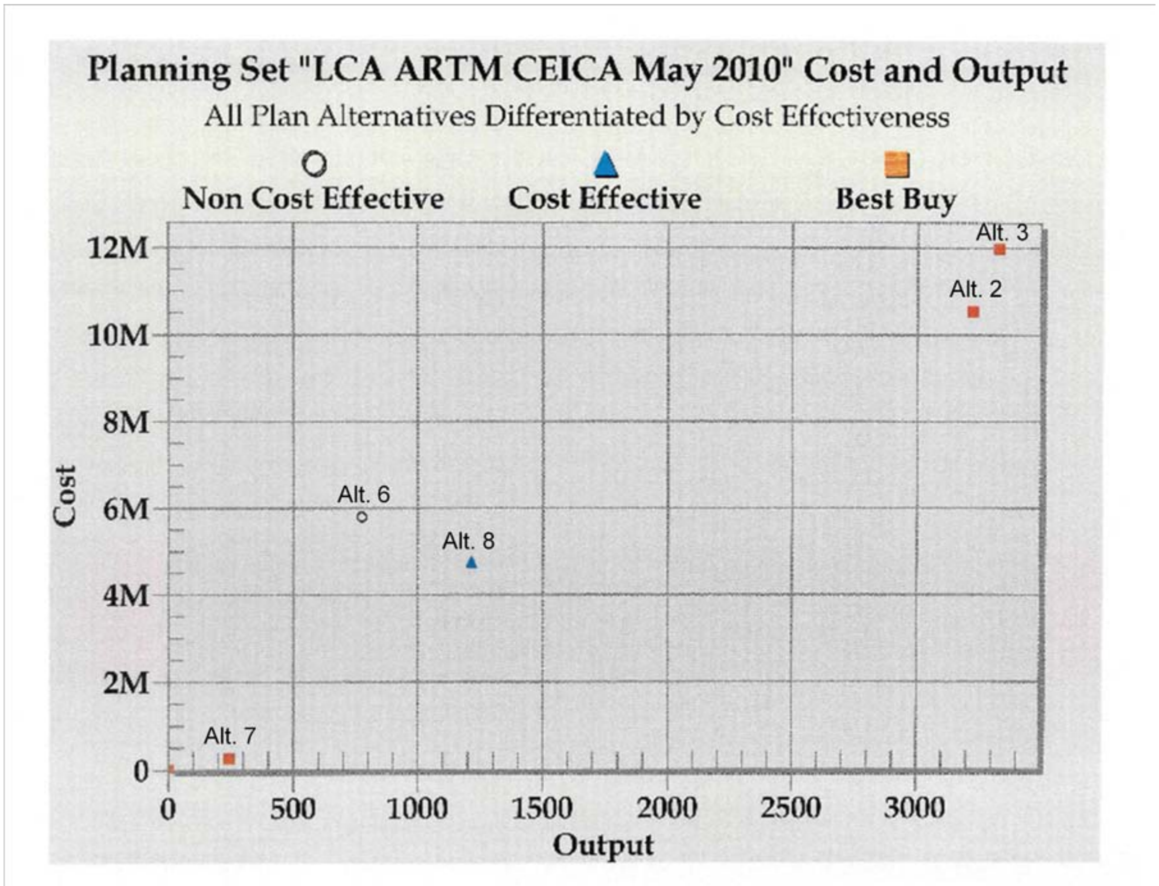

Figure K1: CE/ICA of Non-Cost Effective, Cost Effective and Best Buy Alternatives

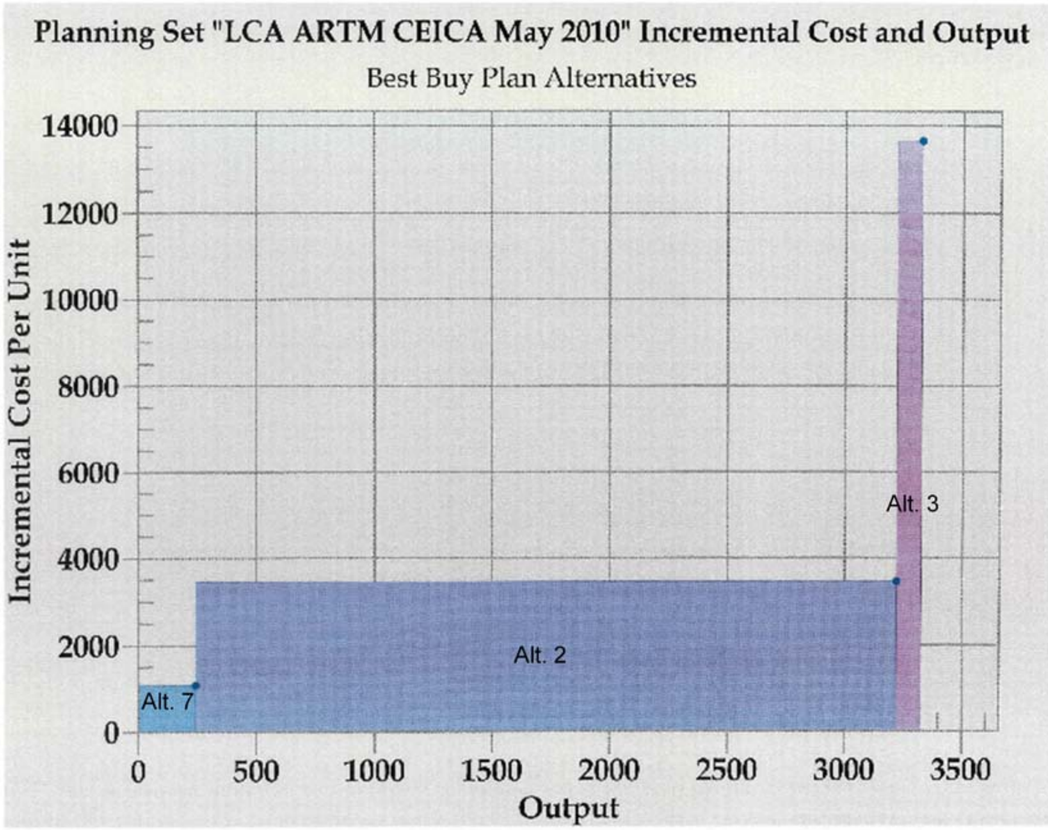

Figure K2: ICA of Best Buy Plans

1.4 OTHER FACTORS

1.4.1 Navigation Effects

The Houma Navigation Canal (HNC) is a 40.5 miles channel with authorized dimensions of 15 feet deep by 150 feet wide from Houma to mile zero and 18 feet deep by 300 feet wide to the 18-foot contour of the Gulf of Mexico. A lock structure located along the Canal consists of a 250-foot wide floodgate and a 200-foot lock. Typically the floodgate is secured in the ‘open’ position, allowing vessel traffic to transit thru the gate opening. The recommended Alternative would require closure of this gate, forcing vessel traffic to transit the Canal via the lock. The effects of such a gate closure on potential navigation delays were analyzed and evaluated under the navigation section of the Economic Appendix of the <u>2002 Final Feasibility Report for the Mississippi River and Tributaries, Morganza, Louisiana to the Gulf of Mexico, Hurricane Protection</u>. As noted in the 2002 Report, historically traffic on the Houma Canal has been roughly the same since 1992, where variations in tonnage can be tied directly to the fortunes of the oil and gas industry. Any changes in traffic would be associated with new finds in the Gulf of Mexico and/or new facilities within the Canal’s service area. Therefore, for this report as was the case for the 2002 Report, 1995 traffic patterns and total volumes are used as the typical year for both with and without project conditions, and are held constant over the project life for purposes of this analysis. Implementation of Alternative #2 would increase annual closure duration of the floodgate from two months (No Action Alternative) to twelve months, thereby delaying 10 months of HNC traffic. Assuming Houma Canal vessel traffic patterns as described here, transiting the 200-foot wide lock due to closure of the floodgate is estimated to generate average annual navigation delay costs during this 10-month closure period of approximately $240,600, which is considered an upper bound estimate. Therefore, navigation effects along the Houma Canal given closure of the floodgate are estimated as minimal if not negligible to the vessel traffic industry. As a perspective, the 2002 Report estimates an extended halt to navigation within the Canal would halt all traffic and demand relocation by oil platform manufacturing industries, resulting in NED impacts estimated in excess of $100 million. Navigation delay costs of $240,600 generated under the implementation of the recommended Alternative would therefore be approximately two-tenths of one percent of the $100 million navigation delay figure estimated under extended navigation interruption. Additional details are provided in the March 2002 Final Feasibility Report.

1.4.2 Acceptability, Completeness, Effectiveness, and Efficiency

Alternative Plan 3 meets the four evaluation criteria of the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies. Special consideration is also given to these criteria within the larger context of the LCA Report (2004). The four criteria are acceptability, completeness, effectiveness, and efficiency.

***Acceptability*.** The plan is acceptable to Federal, state, tribal, local entities, and the public. It is compatible with existing laws, regulations, and policies.

Completeness. The plan is complete. Realization of the plan does not depend on implementation of actions outside the plan.

Effectiveness. The plan is effective. It addresses most of the project objectives. It improves marsh habitat by restoring deltaic process related to freshwater, nutrient and sediments.

Efficiency. The plan is efficient. It is a cost-effective solution to the stated problems and objectives. No other plan produces the same level of output more cost effectively. The plan is cost effective and provides the greatest increase in benefits for the least increase in cost.

1.4.3 Recommended Plan

The PDT recommends Alternative Plan 2 as the recommended plan (RP).

This alternative best meets the study objectives. It would result in restoration of deltaic processes within the project area. In cooperation with the USFWS, NOAA, and the State of Louisiana the Corps has planned and would design a project that serves the needs of the nation.