Appendix D

Economics

BACKGROUND INFORMATION

INTRODUCTION

General. The Revised Integrated Draft Feasibility Report and Programmatic Environmental Impact Statement is a dual purpose feasibility study with both NED and NER components.

This appendix presents an economic evaluation of the NED alternatives developed to provide storm surge risk reduction in Cameron, Calcasieu and Vermilion Parishes in southwest coastal Louisiana.. This appendix also presents an economic analysis of the NER plans considered for the restoration of the ecosystem and environmental conditions in southwest coastal Louisiana, specifically including the Chenier Plain. . These analyses were prepared in accordance with Engineering Regulation (ER) 1105-2-100, Planning Guidance Notebook, and ER 1105-2-101, Planning Guidance, Risk Analysis for Flood Damage Reduction Studies. The National Economic Development Procedures Manual for Flood Risk Management and Coastal Storm Risk Management, prepared by the Water Resources Support Center, Institute for Water Resources, was also used as a reference, along with the Users Manual for the Hydrologic Engineering Center Flood Damage Analysis Model (HEC-FDA). IWR-Plan was used to facilitate the analyses of NER plans.

The structure inventory used in the NED evaluation of both structural and nonstructural alternatives was initially developed and valued at 2012 price levels. However, the estimates of economic damages, benefits, net benefits, NED costs and NER costs were reported using Fiscal Year 2015 price levels (October 1, 2014). The year 2025 was identified as the base year for each of the NED and NER alternatives. Estimates of interest during construction and amortization of present values were conducted using the FY 2015 Federal discount rate of 3.375 percent.

Regional Economic Development. The Regional Economic Development (RED) account is addressed Part 5 of this Appendix. . If the economic activity lost in the flooded region can be transferred to another area or region in the national economy, then these losses are not included in the NED account. However, the impacts on the employment, income, and output of the regional economy are considered part of the RED account and are generated by the spending stimulus originating with the additional expenditures required to construct the plan. The input-output macroeconomic model RECONS was used to address the impacts of the construction spending only associated with the NED recommended plan, since only this alternative provides detailed cost information necessary to prepare a complete and accurate analysis.

DESCRIPTION OF THE STUDY AREA

Geographic Location. Located in southwest Louisiana the study area includes three parishes; Calcasieu, Cameron, and Vermilion. The Southwest Coastal evaluation area was initially divided into 81 unique hydrologic reaches. To enable an economic analysis of the project alternatives through the use of the HEC-FDA certified model, the area was further refined to include 90 reaches. Of these 90 reaches, only 63 were shown to include economic assets that were subject to inundation damages. The study area is bounded to the west by the Sabine River, which forms the Texas-Louisiana border, to the east by the border of Vermilion and Iberia parishes, and to the south by the Gulf of Mexico. The study area contains marshlands, agricultural lands, a wildlife refuge, and coastal communities that are not protected by any Federal levee system. Communities located within the study area include Lake Charles, Vinton, and Sulphur in Calcasieu Parish, Hackberry and Holly Beach in Cameron Parish, and Erath and Abbeville in Vermilion Parish. The area is subject to rainfall and tidal flooding from tropical storms and hurricanes, which result in structural, agricultural, and environmental damages. A map depicting the locations of these reaches is shown in Chapter 2– Plan Formulation.

Land Use. The total number of acres of developed, agricultural, and undeveloped land in the study area is shown in Table 1. As shown in the Table, approximately 3 percent of the total acres in the study area are currently developed. Since there are approximately 834,414 acres of agricultural land and 1,312,216 acres of undeveloped land there is sufficient land available to accommodate the projected residential and non-residential development through the year 2075 without impacting the wetlands in the area. This projected future development is expected to be located on parcels that tend to be relatively higher ground and are the least exposed to flood risk since floodplain regulations require that the elevation of the first floor of any structure so constructed be at or above the base flood elevation specified in the affected community's Flood Rate Insurance Map, published by FEMA as a condition of participation in the National Flood Insurance Program.

SOCIOECONOMIC SETTING

Population and Number of Households. Table 2 displays the population in each of the parishes for the years 1970, 1980, 1990, 2000, and 2010 as well as projections for the year 2020 and the year 2080. Population projections are based on the Moody's County Forecast Database, which has population projections to the year 2038. Moody's projections were extended using a linear trend by New Orleans District based on historical data. As shown in Table 2, Calcasieu, and Vermilion Parishes experienced a steady increase in population between 1970 and 2010. Cameron Parish experienced a decline in population following Hurricane Rita in 2005.

Table 3 displays the estimated population within the inventoried study area for the year 2010 and the projected population for the years 2025 and 2075. The 2010 estimates are based on an inventory of residential and non-residential properties assembled in 2010 by field survey teams. The number of inventoried residential structures was then multiplied by 2.7, the average number of persons per household in the study area in 2012. The annual compounded growth rate in population in the study area between 2010 and 2080 is expected to be 0.41 percent and 0.32 percent between 2020 and 2080.

Table 4 shows the total number of households in each parish for the years 1970, 1980, 1990, 2000, and 2010 and projections for the years 2020 and 2080. The projected number of households was based on the Moody's County Forecast Database and extended from the year 2038 to the year 2080 based on a linear growth rate using historical data.

Calcasieu and Vermilion experienced a steady increase in the total number of households between 1970 and 2010, which paralleled the growth in population. The number of households in Cameron decreased between 2000 and 2010 largely due to Hurricane Rita in 2005.

Income. Table 5 shows the per capita, personal income levels for each parish for the years 1990, 2000, 2005, 2010 and 2011, the year with the latest available data. As shown in the table, the three parishes experienced a steady increase in per capita income between 1990 and 2011.

Employment. Table 6 shows the total employment by parish for the years 1970, 1980, 1990, 2000, 2010, and projections for the years 2020 and 2080. The employment projections were based on historical data and extended from the year 2011 to the year 2080 using linear extrapolation.

In all portions of the study area, growth is highly dependent upon the major employment sectors. With the exception of the city of Lake Charles in Calcasieu Parish, most of the land is sparsely populated. However, the area is rich in natural resources and industrial infrastructure. The economy of the coastal communities is centered on fishing, shrimping, and offshore oil services. The agricultural land located 30 to 40 miles inland is used for rice, sugar cane, and livestock production. The northern-most portion of the study area is heavily forested and supports a substantial timber industry. Lake Charles, which is the population center of the region, is the home of large oil refineries, petro-chemical plants, a deep-water port, McNeese State University, and casinos along the lakefront area.

Compliance with Policy Guidance Letter (PGL) 25 and Executive Order 11988.

Given continued growth in employment, it is expected that development will continue to occur with or without the storm surge risk reduction system, and will not conflict with PGL 25 and EO 11988, which state that the primary objective of a flood risk reduction project is to protect existing development, rather than to make undeveloped land available for more valuable uses. However, since the overall growth rate is anticipated to be the same with or without the project in place, the recommended NED plan will not induce development, but would rather reduce the consequences of flood risk after a major storm event.

RECENT FLOOD HISTORY

Tropical Flood Events. While the three parishes have periodically experienced localized flooding from excessive rainfall events, the primary cause of the flood events that have taken place in the three-parish study area has been the tidal surges from hurricanes and tropical storms. During the past 25 years, coastal Louisiana was impacted by eight major tropical events: Hurricane Juan (1985), Hurricane Andrew (1992), Tropical Storm Isidore and Hurricane Lili (2002), Hurricanes Katrina and Rita (2005), and Hurricanes Gustav and Ike (2008). However, the major storms that affected this study area are Hurricane Rita (2005) and Hurricane Ike (2008).

Table 7 provides a summary of the total Federal Emergency Management Agency (FEMA) disaster assistance paid to all Louisiana policyholders as a result of these tropical events. The table includes the number of paid losses, the total amount paid, and the average amount paid on each loss. The total and average paid losses have been converted to reflect 2012 price levels. The table excludes losses that were not covered by flood insurance.

The following is a summary of the two major tropical events and their effects on the three-parish area.

Hurricane Rita. The most significant flood event to affect the Southwest Coastal area since Hurricane Audrey in 1957 was Hurricane Rita. Hurricane Rita made landfall along the Texas-Louisiana border on September 24, 2005, as a Category 3 storm with winds in excess of 120 miles per hour. A storm surge of approximately 15 - 20 feet affected the coastal region from Port Arthur, Texas to Terrebonne Parish, Louisiana. The flooding extended north to Lake Charles, where the downtown and residential areas around the lake were covered with 3 to 6 feet of flooding. With estimated losses of approximately $3 billion, Hurricane Rita became one of the most costly natural disasters in U.S. history. Approximately 55,000 housing units in Calcasieu, Cameron, and Vermilion parishes incurred flood damages as a result of this hurricane.

Approximately 2,000 square miles of farmland and marshes throughout the coastal area were inundated. According to the LSU AgCenter, agricultural losses totaled approximately $490 million. The agricultural resources impacted by the storm include sugarcane, cotton, rice, soybeans, timber, pecans, citrus, and livestock. The losses to aquaculture (crawfish, alligators, and turtles), fisheries (shrimp, oysters, and menhaden), and wildlife and recreational resources totaled approximately $100 million.

Hurricane Ike. On September 12 and 13, the Louisiana coastal region incurred flood damages as Hurricane Ike moved along the Louisiana coast. The area receiving the most widespread flooding from storm surge occurred in Southwest Louisiana, which includes the parishes of Cameron, Calcasieu, and Vermilion.

The hardest hit area was coastal Cameron Parish where almost all 2,900 homes and businesses in the area were impacted by the storm surge. Even though the area was spared a direct hit from the storm, floodwaters extended 30 miles inland to just south of the City of Lake Charles. Hundreds of residents were rescued by search and rescue teams from the Louisiana Department of Wildlife and Fisheries in conjunction with the Louisiana National Guard and the U.S. Coast Guard. The LSU AgCenter estimated that potential lost revenues and damages to the infrastructure of the agriculture, forestry, and fisheries industries in Louisiana resulting from the two hurricanes totaled approximately $959 million. The storm surge primarily affected the cattle, rice, soybeans, and sugarcane.

FEMA Flood Claims. The study area has been impacted by numerous tropical events during the past several decades. According to FEMA data, flood claims for the three parishes in the study area that were paid between 1978 and December 2012 totaled $421 million: $ 132 million in Calcasieu, $173 million in Cameron, and $115 million in Vermilion. Table 8 shows the insurance payments between 1978 and December 2012 for each of the parishes in the study area.

SCOPE OF THE NED ANALYSIS

Problem Description. The study area, which is characterized by low, flat terrain, is highly susceptible to flooding from the tidal surges associated with hurricanes and tropical storms due to its close proximity to the Gulf of Mexico. The apparent subsidence that is taking place along the coast of Louisiana and an increase in relative sea level rise is expected to increase the potential for coastal flooding in the future. As the level of the ground sinks relative to the levels of the Gulf of Mexico, the depth of potential flooding in the future will increase. The largest population centers are Lake Charles in Calcasieu Parish and Abbeville in Vermilion Parish.

This study will focus on the development of a storm risk reduction plan for the area. The ultimate goal is to create either a structural system that will reduce water levels throughout selected protected areas or otherwise reduce flood risk reduction from the implementation of nonstructural measures.

NED Benefit Categories Considered. The NED procedure manuals for coastal and urban areas recognize four primary categories of benefits for flood risk management measures: (1) inundation reduction, (2) intensification, (3) location, and (4) employment benefits. The majority of the benefits attributable to an alternative generally result from the reduction of actual or potential damages caused by inundation. Inundation reduction, which is the only category of NED benefits addressed in this evaluation, includes the reduction of physical damages to structures, contents, and vehicles.

Physical flood damage reduction benefits include the decrease in potential damages to residential and commercial structures, their contents, and the privately owned vehicles associated with these structures. Damages included in the appendix considered both existing and future conditions. Projections of the future development expected to be in place during the period of analysis were included as part of the future without-project condition analysis.

Office of Management and Budget survey forms were used to collect information on the value and placement of contents in the industrial facilities located in the study area. The information from these surveys was used to develop the physical flood damage and benefits for these industrial properties.

ECONOMIC AND ENGINEERING INPUTS TO THE HEC-FDA MODEL

HEC-FDA MODEL

Model Overview. The Hydrologic Engineering Center Flood Damage Analysis (HEC-FDA) Version 1.2.5b Corps-certified model was used to calculate the without-project damages and benefits for the evaluation. The economic and engineering inputs necessary for the model to calculate without-project damages for existing conditions (2012), the project base year (2025), and the final year in the period of analysis (2075) include structure inventory, future development, contents-to-structure value ratios, vehicles, first floor elevations, and depth-damage relationships, ground elevations, and without-project stage probability relationships.

The uncertainty surrounding each of the economic and engineering variables was also entered into the model. Either a normal probability distribution, with a mean value and a standard deviation, or a triangular probability distribution, with a most likely, a maximum and a minimum value, was entered into the model to quantify the uncertainty associated with the key economic variables. A normal probability distribution was entered into the model to quantify the uncertainty surrounding the ground elevations. The number of years that stages were recorded at a given gage was entered for each study area reach to quantify the hydrologic uncertainty or error surrounding the stage-probability relationships.

ECONOMIC INPUTS TO THE HEC-FDA MODEL

Structure Inventory. Field surveys were completed in 2010 to develop a residential and non-residential structure inventory for the economic analysis. Based on the structural information collected during the field surveys, the Marshall and Swift Valuation Service was used to calculate a depreciated replacement cost for all residential and non-residential structures in the portion of the study area within the 500-year floodplain. . The inventoried structures were classified as one of 14 structure types: residential one-story with slab or pier foundation, residential two-story with slab or pier foundation, mobile home, eating and recreation, grocery and gas station, multi-family residence, professional building, public and semi-public building, repairs and home use establishment, retail and personal services building, and warehouse, and contractor services building. Table 9 shows the number of structures by structure category and the total number of vehicles associated with the residential structures for existing conditions. The value of the land was not included in the analysis. Table 10 shows the number of structures in each structure category and the average depreciated replacement values for existing conditions at 2012 price levels.

The reduction in expected future damages to the physical plant of industrial facilities was considered as an NED benefit for BCR computations. To achieve this, direct telephone contact was initiated to all of 71 owners/operators of industrial facilities in the inventoried area, requesting information relating to the replacement cost of at-risk facility components and associated depth-percent-damage relationships that are required for benefit computation. Of these 71 inquiries, 44 were successful in obtaining data that is required in the economic analysis. However, no information was provided by remaining 27 owners/operators. Lacking these data, no speculative estimation of depth-damage relationships to these facilities was made and as a result, the structure inventory used to evaluate damages and benefits for levee plans does not include these facilities.

Future Development Inventory. Projections were made of the future residential and non-residential development to take place in the study area under without-project conditions. Based on a pattern of historical development, a total of 3,750 residential and 396 non-residential structures were placed on the undeveloped land within the study area reaches as part of the structure inventory for the year 2025. An additional 14,994 residential and 1,580 non-residential structures were added to the inventory for the year 2025 to obtain the structure inventory for the year 2075. Table 11 shows the projected number of structures in each structure category for the future years 2025 and 2075, respectively. The value of the land was not included in the analysis.

The development projected to occur in each study area reach between the year 2012 and the year 2025 was placed at an elevation equal to the stage associated with the 2025 without-project one percent annual chance exceedance (1% ACE) (100-year) event, unless the ground elevation was higher. The projected development occurring after the year 2025 was placed at an elevation equal to the stage associated with the without-project 1% ACE (100-year) event for the year 2075, unless the ground elevation was higher. The values for the projected residential and non-residential structures were assigned using the average value calculated for each structure category based on the 2010 existing development.

Floodplain regulations, mandated by the NFIP and executed through local ordinances, building codes and permits, require that the first floor elevation of any new structure be placed at or above the base flood elevation as indicated by the corresponding Flood Rate Insurance Map for a particular community. Therefore, while structures that are expected to be placed into service in the future are included in the structure inventory, their exposure to flood risk is significantly less than many structures found in the inventory under existing conditions. For levee plans that provide flood risk reduction up to the base flood elevation 1% (100-year) ACE event, little if no benefits accrue to these structures. Therefore, their addition to the structure inventory has a minor impact on benefit estimates.

Residential and Non-Residential Content-to-Structure Value Ratios. The content-to-structure value ratios (CSVRs) used in this evaluation were based on the on-site interviews conducted as part of the Morganza to the Gulf evaluation. These interviews were conducted with the owners of a sample of structures from each of the three residential content categories and each of the eight non-residential content categories from each of the three evaluation areas. A total of 10 residential structures and 80 non-residential structures were used to determine the CSVRs for each of the residential and non-residential categories. The results are summarized in Table 12.

Since only a limited number of property owners participated in the field surveys and the participants were not randomly selected, statistical bootstrapping was performed to address the potential sampling error in estimating the mean and standard deviation of the CSVR values. Statistical bootstrapping is a method that uses re-sampling with replacement to improve the estimate of a population statistic when the sample size is insufficient for straightforward statistical inference. The bootstrapping method has the effect of increasing the sample size. Thus, bootstrapping provides a way to account for the distortions caused by the specific sample that may not be fully representative of the population.

Vehicle Inventory. Based on 2000 Census block group data for the evaluation area, it was determined that there are an average of 1.64 vehicles associated with each household (owner occupied housing or rental unit). According to the Southeast Louisiana Evacuation Behavioral Report published in 2006 following Hurricanes Katrina and Rita, approximately 70 percent of privately owned vehicles are used for evacuation during storm events. The remaining 30 percent of the privately owned vehicles remain parked at the residences and are subject to flood damages. Using the Manheim Used Vehicle Value Index, which is based on over 4 million annual automobile transactions adjusted to reflect retail replacement value, each vehicle was assigned an average value of $13,411 at the 2014 price level. Since only those vehicles not used for evacuation can be included in the damage calculations, an adjusted average vehicle value of $6,598 ($13,411 x 1.64 x 0.30) was assigned to each individual residential structure record in the HEC-FDA model. If an individual structure had more than one housing unit, then the adjusted vehicle value was assigned to each housing unit in a residential or multi-family structure category.

First Floor Elevations and Elevation of Vehicles. Topographical data obtained from the Light Detection and Ranging (LIDAR) digital elevation model (DEM) using the NAVD88 (2004.65 epoch) were used to determine ground elevations. Field survey teams estimated the height of each residential and non-residential structure above the ground using hand levels. The ground elevation was added to the height of the foundation of the structure above the ground in order to determine the first floor elevation of the structure. Vehicles were assigned to the ground elevation of the adjacent residential structures.

Depth-Damage Relationships. Site-specific saltwater, long duration (approximately one week) depth-damage relationships, developed by a panel of building and construction experts for structures, contents, and vehicles and CSVRs in support of the Lower Atchafalaya and Morganza to the Gulf, Louisiana feasibility study were used in the economic analysis. These curves indicate the percentage of the total structure value that would be damaged at various depths of flooding. Damage percentages were determined for each one-half foot increment from one-half foot below first floor elevation to two feet above first floor, and for each one-foot increment from 2 feet to 15 feet above first floor elevation. The panel of experts developed depth-damage relationships for five residential structure categories and for three commercial structure categories. Depth-damage relationships were also developed for three residential content categories and eight commercial content categories. The depth-damage relationships for vehicles were developed based on interviews with the owners of automobile dealerships that had experienced flood damages and were used to calculate flood damages to vehicles at the various levels of flooding.

Table 13 shows the residential and non-residential depth-damage relationships developed for structures, contents, and vehicles.

Uncertainty Surrounding the Economic Inputs. The uncertainty surrounding the four key economic variables was quantified and entered into the HEC-FDA model. These economic variables included structure values, contents-to-structure value ratios, first floor elevations, and depth-damage relationships. The HEC-FDA model used the uncertainty surrounding these variables to estimate the uncertainty surrounding the stage-damage relationships developed for each study area reach.

Structure and Vehicle Values. In order to quantify the uncertainty surrounding the values calculated for the residential and non-residential structure inventory, several survey teams valued an identical set of structures from various evaluation areas in the Gulf Coast region. The structure values calculated by each of the teams during windshield surveys were used to develop a mean value and a standard deviation for each structure in the sample. The standard deviation was then expressed as a percentage of the mean value for that structure. The average standard deviation as a percentage of the mean for the sampled structures was then used to represent the uncertainty surrounding the structure value for all the inventoried residential and non-residential structures. The average standard deviation, which was expressed as a percentage of the mean structure value, totaled 12.15 percent for residential structures and 14.28 percent for non-residential structures.

The uncertainty surrounding the values assigned to the vehicles in the inventory was determined using a triangular probability distribution function. The Manheim vehicle value, adjusted for number of vehicles per household and for the evacuation of vehicles prior to a storm event, was used as the most likely value. The average value of a new vehicle before taxes, license, and shipping charges was used as the maximum value, while the average 10-year depreciation value of a vehicle was used as the minimum value.

Content-to-Structure Value Ratios. As shown in Table 12, a CSVR was computed for each residential and non-residential structure in the sample based on the total depreciated content value developed from the surveys. An average CSVR and standard deviation for each of the five residential structure categories and nine commercial structure classifications was calculated as the average of the individual structure CSVRs

First Floor Elevations. The topographical data used to estimate the first floor elevations assigned to the structure inventory contain two sources of uncertainty. The first source of uncertainty arises from the use of the 2009 LIDAR data, and the second source of uncertainty arises from the use of hand levels to determine the structure foundation heights above ground elevation. The error implicit in using LIDAR data to estimate the ground elevation of each of the inventoried structures is normally distributed with a mean of zero and a standard deviation of 0.297 feet. According to the Hydrologic Engineering Center training manual, and the uncertainty implicit in estimating foundation heights using hand levels from within 50 feet of the structure is normally distributed with a mean of zero and a standard deviation of 0.3 feet at the 95 percent level of confidence.

Depth-Damage Relationships. A triangular probability density function was used to determine the uncertainty surrounding the damage percentage associated with each depth of flooding. A minimum, maximum and most likely damage estimate was provided by a panel of experts for each depth of flooding. The specific range of values regarding probability distributions for the depth-damage curves can be found in the final report mentioned above.

ENGINEERING INPUTS TO THE HEC-FDA MODEL

Ground Elevations. USACE Geospatial Engineering Section acquired elevation data for the study area. The LIDAR data were processed and used to create a digital elevation model (DEM) with a five-foot by five-foot horizontal grid resolution. The DEM used NAVD88 2004.65 vertical datum to determine the ground elevations for each of the residential and non-residential structures.

Stage-Probability Relationships and Levee Features. Stage-probability relationships were provided for the existing (2012) without-project condition and future without-project conditions (2025 and 2075). Water surface profiles were provided for eight annual chance exceedance (ACE) events: 99% (1-year), 20% (5-year), 10% (10-year), 4% (25-year), 2% (50-year), 1% (100-year), 0.5% (200-year), and 0.2% (500-year). The water surface profiles were based on storm surge and incorporated rainfall events.

Under with-project conditions, a top of levee elevation for each reach in a levee alignment was entered into the HEC-FDA models for three levels of risk reduction (50-year, 100-year, and 200-year) for the six structural alternatives. A top of levee elevation equal to the stage associated with the 10% (10-year) ACE event for each study area reach was also entered into the HEC-FDA models in order to adjust the results for damages caused by rainfall. The stages associated with the events more frequent than the 10-year event are almost exclusively based on rainfall rather than storm surge.

Uncertainty Surrounding the Engineering Inputs. The uncertainty surrounding two key engineering parameters was quantified and entered into the HEC-FDA model. These engineering variables included ground elevations and the stage-probability curves. The HEC-FDA model used the uncertainty surrounding these variables to estimate the uncertainty surrounding the elevation of the storm surges for each study area reach.

Ground Elevations. A topographic survey was conducted to estimate the uncertainty surrounding the use of the LIDAR data to estimate ground elevations in urbanized areas. The uncertainty surrounding the ground elevations was 0.297 feet for a residential and non-residential structure which was discussed in the first floor elevation uncertainty section of this report.

Stage-Probability Relationships. A 50-year equivalent record length was used to quantify the uncertainty surrounding the stage-probability relationships for each study area reach.
Based on this equivalent record length, the HEC-FDA model calculated the confidence limits surrounding the stage-probability functions.

NED FLOOD DAMAGE AND BENEFIT CALCULATIONS FOR STRUCTURAL ALTERNATIVES

HEC-FDA Model Calculations. The HEC-FDA model was utilized to evaluate flood damages using risk-based analysis. Damages were reported at the index location for each of the 90 reaches for which a structure inventory had been conducted. A range of possible values, with a maximum and a minimum value for each economic variable (first floor elevation, structure and content values, and depth-damage relationships), was entered into the HEC-FDA model to calculate the uncertainty or error surrounding the elevation-damage, or stage-damage, relationships. The model also used the number of years that stages were recorded at a given gage to determine the hydrologic uncertainty surrounding the stage-probability relationships.

The possible occurrences of each variable were derived through the use of the Monte Carlo simulation, which used randomly selected numbers to simulate the values of the selected variables from within the established ranges and distributions. For each variable, a sampling technique was used to select from within the range of possible values. With each sample, or iteration, a different value was selected. The number of iterations performed affects the simulation execution time and the quality and accuracy of the results. This process was conducted simultaneously for each economic and hydrologic variable. The resulting mean value and probability distributions formed a comprehensive picture of all possible outcomes.

Stage-Damage Relationships with Uncertainty. The HEC-FDA model used the economic and engineering inputs to generate a stage-damage relationship for each structure category in each study area reach under existing (2012) and future (2025 and 2075) conditions. The possible occurrences of each economic variable were derived through the use of the Monte Carlo simulation. A total of 1,000 iterations were executed by the model for the study. The sum of all sampled values was divided by the number of samples to yield the expected value for a specific simulation. A mean and standard deviation was automatically calculated for the damages at each stage.

Stage-Probability Relationships with Uncertainty. The HEC-FDA model used an equivalent record length (50 years) for each study area reach to generate a stage-probability relationship with uncertainty for the without-project condition under existing (2012) and future (2025 and 2075) conditions through the use of graphical analysis. The model used the eight stage-probability events together with the equivalent record length to define the full range of the stage-probability or stage-probability functions by interpolating between the data points. Confidence bands surrounding the stages for each of the probability events were also provided.

Without-Project Expected Annual Damages. The model used the Monte Carlo simulation to sample from the stage-probability curve with uncertainty. For each of the iterations within the simulation, stages were simultaneously selected for the entire range of probability events. The sum of all damage values divided by the number of iterations run by the model yielded the expected value, or mean damage value, with confidence bands for each probability event. The probability-damage relationships are integrated by weighting the damages corresponding to each magnitude of flooding (stage) by the percentage chance of exceedance (probability). From these weighted damages, the model determined the expected annual damages (EAD) with confidence bands (uncertainty). For the without-project alternative, the expected annual damages were totaled for each study area reach to obtain the total without-project EAD under existing (2012) and future (2025 and 2075) conditions. Table 14 shows the expected annual damages for structures, contents and vehicles for 2012, 2025 and 2075 and the percentage increase between 2012 and 2025 and 2012 and 2075. Table 15 shows the number and type of structures that are damaged by each annual chance exceedance event for the years 2025 and 2075 using the intermediate sea level rise scenario. Table 16 shows the equivalent annual without-project damages by study area reach.

Structural Alternatives. Based on existing economic and engineering data, the location of without-project damages, and parametric costs, six structural alternatives were developed. Three alternatives, Abbeville to Delcambre, Delcambre/Erath, and Abbeville Ring Levee, are located in the eastern portion of the study area. Three alternatives, Lake Charles Westbank Sulphur Extended, Lake Charles Westbank Sulphur South, and Lake Charles Eastbank, are located in the western portion of the study area. Three levels of risk reduction (50-year, 100-year, and 200-year) were evaluated for each of the six structural alternatives.

Economic and engineering inputs were developed and entered into HEC-FDA models for each of the six structural alternatives. Tables 17 and 18 show the expected annual without-project damages, with-project damages, and damages reduced at the 0.02 (50-year) annual exceedance probability (AEP), the 0.01 (100-year) AEP, and the 0.005 (200-year) AEP for each of structural alternatives for the years 2025 and 2075, respectively. The expected annual without-project damages, with-project damages, and damages reduced were converted to equivalent annual values using the FY 2015 Federal discount rate of 3.375 percent and a 50-year period of analysis.

The total project cost for each of the structural alternatives includes construction costs, interest during construction, and operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) for the three levels of risk reduction. Mitigation costs were only included for the Lake Charles Eastbank alternative. Tables 19, 20 and 21 show the calculation of the estimated annual cost for the alternatives using the 3.375 percent discount rate and a 50-year period of analysis.

Tables 22 through 39 show the equivalent annual without-project damages, with-project damages and benefits, annual costs, and equivalent annual net benefits for the six structural alternatives at the three levels of risk reduction. Adjustments were made to the with-project damage results to account for damages that would occur with the project alternative in place as a result of rainfall rather than storm surge. A top of levee elevation equal to the stage associated with the 10% (10-year) ACE event was entered into the HEC-FDA model. The damages reduced by the 10-year levee adjustment were added to the with-project damages for each of the three levels of risk reduction. The increase in the with-project damages has the effect of reducing the benefits from the project alternatives. The negative net benefit results show that the six structural alternatives are not economically justified.

NED FLOOD DAMAGE AND BENEFIT CALCULATIONS FOR NONSTRUCTURAL ALTERNATIVES

Nonstructural Measures. Nonstructural measures comprise an alternative approach to reducing flood risk in addition to or in combination with structural measures. The implementation of a nonstructural measure does not alter the hydrologic characteristics of the floodplain. There is no change in hydrology between without-project and with-project conditions that can be measured through modeling. Rather, nonstructural measures succeed in reducing flood risk by altering the susceptibility to flooding of economic assets in the floodplain. The most common of these physical measures include structure elevation, acquisition (buy-out), floodproofing (dry or wet), and "localized storm surge risk reduction measures" (berms). Among other nonstructural measures identified by the Corps' National Nonstructural Flood Proofing Committee (NFPC) are flood warning preparedness, floodplain regulation, and flood insurance.

This study considered the following as the most appropriate of nonstructural measures: structure elevation for residential structures: dry flood proofing of non-residential structures (commercial and public buildings): and the construction of berms around warehouse facilities. Elevation was considered the most appropriate nonstructural measure for residential structures given it effectiveness and the fact that there are a significant number of firms (elevation or shoring companies) in coastal Louisiana that have over recent years developed considerable expertise in implementing this type of engineered solution. In contrast, elevation of most non-residential properties was found not to be a practical nonstructural alternative given the unique and diverse characteristics of most of these structures. The construction types that characterize restaurants, gas stations, municipal offices, and retail stores, for instance, do not lend themselves to standard elevation practices, whereas floodproofing techniques are expected to be far more cost-effective. For this study, floodproofing consists of the application of an impermeable barrier along the perimeter of the structure, supported by adjacent retaining walls as necessary, and the placement of temporary barriers, or dams, at entryways immediately in advance of floods which, for coastal storm surge events, have significant warning time to make this approach effective.

Structure elevation and floodproofing each have limitations. The elevation of residential structures beyond 13 feet above adjacent ground is not considered a safe practice (even if special and more costly engineering techniques could be designed) since the structure would become significantly more exposed to the effects of wind damage—again characteristic of coastal storms. Floodproofing is effective up to only three feet above adjacent ground. The implementation of floodproofing treatments beyond this limit would result in a significant disparity in hydrostatic pressures between the unprotected and protected side of the building walls should the depth of flooding exceed three feet and the structural integrity of the building would therefore be compromised.

For warehouses, berm placement is generally the most appropriate measure to reduce flood risk. Given the geometry and composition of warehouse framing and walls, the application of floodproofing techniques becomes problematic. Instead, the placement of a small-scale berm around the perimeter of the warehouse, contingent upon the unique characteristics of the site, would provide flood risk reduction up to 6 feet of flood depth. The 6-foot limit for the height of nonstructural berms was selected based upon a design developed for a similar nonstructural plan for a separate study in coastal Louisiana (West Shore—Lake Pontchartrain, La.) and is consistent with recent recommendations of the NFPC.

Nonstructural measures for industrial facilities were not considered for this study. The complex, diverse, and atypical nature of the facilities requires detailed engineering investigations on a location-specific basis to design a set of measures that would be unique to each facility and that would be effective in reducing flood risk. Close coordination and consultation with facility owners/operators would be required to develop feasibility level designs and costs necessary to complete the analysis of economic feasibility.

Acquisition of residential properties was also considered as a nonstructural measure. The advantage of acquisition is that it eliminates all flood risk at the location of the property under study. The disadvantage is that acquisition tends to represent the most costly measure to implement since relocation costs are an NED cost that is attributable to the project and that a non-Federal sponsor would take ownership of the acquired property and thereby incur the cost of demolition and perpetual maintenance of the vacated parcel, which again is an NED cost. As a condition of acquisition, no further development of the parcel would be permitted. An evaluation of the economic feasibility of acquisition is discussed later in this appendix. Acquisition would also be considered for residential structures as an option if structure elevation is otherwise precluded, such as in the case where the minimum required elevation (to the base flood elevation) is greater than 13 feet, or that the dwelling is found to be structurally unsound,

Flood warning preparedness, floodplain regulation, and flood insurance were not further considered as nonstructural measures for this investigation. In coastal Louisiana, public warning of approaching or impending coastal storms is highly developed and effective. Evacuation protocols, executed by coastal parishes in coordination with the Louisiana Department of Homeland Security and Emergency Preparedness, are robust and mature. Nearly all residents of coastal Louisiana possess an extremely high awareness of flood risk from coastal storms during the well-established season beginning each year on June 1 and ending on November 30. While improvements to public warning, preparedness, and evacuation can always be assessed, it was determined that the potential to significantly further reduce NED inundation damages by further coordination with parish and state emergency planners would not be as effective as compared to alternative methods described above.

With respect to floodplain regulations as a nonstructural measure, the preparation of a floodplain management plan by the non-Federal partner or benefiting community is a requirement of the project partnership agreement that executes any flood risk reduction project for which there is a Federal interest. The parishes that are included in the study area, Cameron, Calcasieu, and Vermilion, each have pre-existing floodplain management plans that were established as a condition of participating in the National Flood Insurance Program (NFIP). These plans articulate a wide range of requirements, limits, and qualifications that significantly impact how properties are developed in the jurisdictional floodplains. The most notable of these is the requirement that the first floor of all newly-constructed structures be placed at or above the base flood elevation (BFE), i.e. the elevation associated with the 0.01 annual chance event (100-year stage) as indicated on the corresponding Flood Rate Insurance Maps. Also, repetitively flood-damaged structures, or structures that are significantly damaged (50% or more of the market value of the structure) that are located within the 100-year floodplain must be elevated to the BFE. Therefore, pursuing refinements to existing floodplain management plans, beyond those mandated by the NFIP would be in addition to, and not a replacement of, the nonstructural measures previously identified. Similar to that of flood warning preparedness, it was determined that since such plans are already in place, that the potential for refinements to significantly reduce NED damages was not as significant compared to alternative nonstructural methods described above.

Flood insurance is often included among those in the “toolbox” of nonstructural measures. Flood insurance is acquired by individual property owners from the Flood Insurance Administration (FIA), through the NFIP, and is usually underwritten by local insurance agents. No applicant with property located in a community that participates in NFIP can be denied a policy. Flood insurance is an effective means to manage flood risk by diversifying such risk within a pool of common policy holders on a nation-wide basis. As a nonstructural measure, the effect of flood insurance is to attenuate the severity of the financial impact of flood-related losses, not the physical consequences that are usually ascribed to flood risk. For this reason, no NED impacts are present to be evaluated for the purposes of economic justification.

Scope of Nonstructural Measures. Nonstructural measures could be implemented for each residential structure, non-residential structure, and warehouse facility in the study area.. This could potentially include the 51,857 residential and non-residential structures counted within the 500-year overflow that defines the study area in the year 2012. Nonstructural plans that were considered in initial screening consisted of applying nonstructural measures either to all residential and nonresidential structures in the study area within the 100-year floodplain (under 2075 hydrologic conditions), or to only a subset of structures that when evaluated collectively at the reach level, were found to be economically justified. The results of this initial screening are found in Appendix C.

Upon the completion of initial screening, an alternative approach to the formulation of nonstructural measures was adopted that focused on those structures that are subject to the highest levels of flood risk. Under this approach, nonstructural measures were limited to those structures that were determined to have first-floor elevations at or below the 100-year overflow (0.01 ACE stage) in the base year of the study, 2025. (While relative sea level rise is expected to raise the 100-year stage throughout the 50-year period of analysis and bring the FFEs for other structures into the 100-year floodplain, economic benefits for implementing such plans for these structures in the year 2025 are heavily discounted and with rare exception were found to lack economic justification.) The stage associated with the 100-year overflow was selected as the criterion for identifying the structures with the highest flood risk and potential candidates for nonstructural solutions to reduce this risk. The rationale for the elevation is based upon floodplain regulations in effect for any community that participates in the NFIP. As a condition of NFIP participation, communities must enforce ordinances requiring, through the issuance of building permits, that the minimum height of any structure construction or elevation activity is no less than the base flood elevation (100-year stage).

For structures with FFEs within the 100-year floodplain, the nonstructural analysis was optimized on the basis of strata of floodplains. Structures found between the 0 and 25 year floodplains were deemed to be exposed to the highest level flood risk and were considered as an increment for project implementation (Phase I). A separate project increment (Phase II) considers only structures with FFEs higher than the 25 year stage, but lower than or equal to the 50 year stage. A third project incement (Phase III) encompasses all remaining structures within the 100-year floodplain. Because project increments can be evaluated independently for economic justification, they can be combined for implementation as part of a recommended plan, or considered separately for implementation, in phases, at a later date.

Without and With-Project Equivalent Annual Damages. The Hydrologic Engineering Center - Flood Damage Analysis (HEC-FDA) Version 1.2.5b certified model was used to estimate damages and benefits for both structural and nonstructural measures. For nonstructural measures, the model was used to create a separate module that contained all of the residential and non-residential structures with a first floor elevation less than the stage associated with the 0.01 annual exceedance probability, or 100-year event, in the year 2025 for each reach in the evaluation area. The hydrologic reach was used as the unit of analysis and reporting for the model since stage-frequency data were reported at reach level. The HEC-FDA model was then executed to compute without-project damages for all such structures in the module.

Under with-project conditions, the first floor elevation of all residential structures was raised to the stage associated with the 2075 100-year event within each study area reach. Those structures that would otherwise require elevation beyond than 13 feet, were not to be raised at all, but instead would be considered for acquisition. As a result of the analysis, six residential structures were found to require elevation beyond 13 feet and were identified as candidates for acquisition. For non-residential structures, where floodproofing techniques were applied, the depth-damage relationships within corresponding to these structure types were adjusted to eliminate flood damage for the first three feet of flood depth, beyond which damage occurs similar to what is expected under without-project conditions. Flood risk to warehouses was reduced by placement of berms along the perimeter of the structure according to a predefined set of parameters. The height of the berm was set at the 6-feet, which represents the maximum for this type of nonstructural measure. The HEC-FDA model computed damages under with-project conditions using depth-damage curves that were modified so that structures would receive no damages up to six feet of inundation. The result is that damages to warehouses are eliminated for the first six feet of flood depth until the berm is overtopped.

Nonstructural Implementation Costs.

Residential Structures

The estimate of the cost to elevate all residential structures was computed once model execution was completed. Elevation costs were based on the difference in the number of feet between the original first floor elevation and the target elevation (the 100-year stage) for each structure in the HEC-FDA module. The number of feet that each structure was raised was rounded to the closest one-foot increment, with the exception that structures less than one foot below the target elevation were rounded-up to one foot. Elevation costs by structure were summed to yield an estimate of total structure elevation costs. The cost per square foot for raising a structure was based on data obtained during interviews with representatives of three major metropolitan New Orleans area firms that specialize in the structure elevation. Composite costs were derived for residential structures by type: slab and pier foundation, one story and two story configuration, and for mobile homes. Table 40 displays the costs for each of the five residential categories analyzed.

The cost per square foot to raise an eligible residential structure to the target height was multiplied by the footprint square footage of each structure to compute the costs to elevate the structure. The footprint square footage for each structure was determined by applying the average square footage estimated for each residential structure category as shown in Table 41. The average was taken from the structures in the structure inventory Added to the elevation cost was the cost for temporarily lodgings and associated expenses. during the period, average of 30 days) when utility service is likely interrupted. Temporary relocation costs included packing/moving, labor, storage, hotel costs, per diem costs, kennel costs for pets, and contingencies. Contractors provided a median estimate of 30 days for temporary relocations, which is equivalent to $6,148 per structure. Also, a labor estimate of $10,000 per structure to complete required administrative activities by the Federal sponsor in implementing this nonstructural measure was added to the cost of implementation. The total costs for all elevated structures were annualized over the 50-year period of analysis using the Fiscal Year 2015 Federal discount rate of 3.375 percent and an October 2012 price level which was subsequently indexed to October 2014 price levels (Fiscal Year 2015 prices).

Non-Residential Structures

The floodproofing measures were applied to eligible non-residential structures. Separate cost estimates were developed to dry flood proof these structures based on their relative square footage. If the square footage was between zero and 20,000, then the total cost equaled $98,922; between 20,000 and 100,000 square feet, then $306,452; and greater than 100,000 square feet, then $772,158. These costs were developed for the Draft Nonstructural Alternatives Feasibility Study, Donaldsonville LA to the Gulf evaluation (September 14, 2012) by contacting local contractors and were adopted for this study due to the similarity in the structure types between the two study areas. Also, a labor estimate of $10,000 per structure to complete required administrative activities by the

Federal sponsor in accomplishing this nonstructural measure was added to the cost of implementation. Final cost estimates are expressed in Fiscal Year 2015 (October 2014) prices.

Warehouses

The perimeter in linear feet of each warehouse was derived from its square footage, either actual or average depending on availability. A buffer of 160 linear feet was added to the perimeter to account for business activity such as the loading and unloading of trucks. This sum was multiplied by the cost per linear foot of building the berm, $780. Also, a labor estimate of $10,000 per warehouse to complete required administrative activities by the Federal sponsor in implementing this nonstructural measure was added to the cost. As with non-residential structures, these costs were developed for the Draft Nonstructural Alternatives Feasibility Study, Donaldsonville LA to the Gulf evaluation (September 14, 2012), using data from local contractors, and updated to October 2014 prices.

Operations and Maintenance Costs

For the nonstructural measures there are no significant incremental operations, maintenance, relocations, rehabilitation, and replacements (OMRR&R) costs. For elevation measures, there are no further resources necessary to ensure that the engineered activity operates as intended. For floodproofing measures, periodic inspection of the work which may be required is expected to be nomial and infrequent. Such costs are an extremely small percentage of the overall cost of implementation and can be considered capitalized in the initial cost of implementation. OMRR&R for berms is expected to be limited to occasional vegetation control (grass mowing), which is equivalent to a zero incremental cost since this activity already occurs under without-project conditions.

Property Acquisitions

The depreciated replacement cost of each of 6 residential structures identified for acquisition is added to the average land value of $70,000, relocation assistance of $60,000, and a labor estimate of $30,000 per structure to complete required administrative activities by the Federal sponsor.

Table 42 summarizes the costs of the nonstructural measures included in this analysis.

Net Benefit Analysis. Benefits were reported by the HEC-FDA model as the reduction in the without-project damages that would result from implementation of each of the nonstructural measures previously described. Costs were computed exogenous to the model, but using model data with respect to the number of feet by which each structure had been elevated, by the number of linear feet of floodproofing, contingent upon the footprint of the non-residential structure, and by the length of nonstructural berms, that was based on the square-footage of warehouses.

Benefits and costs were then totaled for each floodplain increment and compared to yield an estimate of the net benefits associated with implementing a structure elevation plan for all residential structures within the prescribed floodplain. As indicated earlier, the structure inventory was segmented into three separate floodplains: the 0-25 year, the 25-50 year, and the 50-100 year floodplains. A summary of this segmentation and its comparison to the total study area is found in Table 43a. Table 43b displays the without-project and with-project damages by segment, along with their associated benefits. Table 43c shows the implementation cost and average annual cost for each of the floodplains, or implementation phases. Last, Table 43d provides the calculations of the net benefits and associated benefit-to-cost ratios for these project increments.

This segmentation reveals that the highest benefits, and net benefits, accrue to those structures that are exposed to the highest flood risk, as represented by their proximity in the floodplain to the greatest frequency of flooding. The analysis also suggests that for residential structures that may be found in the less exposed portion of the floodplain (approximating the 100-year stage) that relatively less benefits accrue since the absolute height that such a structure must be raised to be placed at the base flood elevation is less. From this perspective, it is not surprising that the economic feasibility of elevating structures in the 50-100 year floodplain is far less than the others given that structure elevation activities require a relatively significant, fixed mobilization cost and that the cost of each added foot of actual elevation is relatively lower.

In sum, the highest level of net benefits are indicated for the plan increment which implements nonstructural measures to all eligible structures with FFEs below the 25-year stage (2025 hydrologic conditions). The number of structures included is 4,952 with an implementation cost of $824,025 million. The average annual net benefits are $231,621 with a benefit to cost ratio of 7.74 to one. The recommended plan achieves completeness throughout the study area with respect to the 25-year floodplain, reducing the complexity of its formulation, and thereby enhancing the implementability of the plan. Net benefits for structures considered in Phase II are considerably less than those found in Phase I, which is expected due to the presence of relatively less flood risk. Net benefits remain positive and support the Federal interest for subsequent implementation. In contrast, net benefits for Phase III are negative. This result owes to the fact that properties within these floodplains do not require the same magnitude of elevation as do the structures considered in Phases I and II. Given the high fixed costs of conducting the elevation-in-place technique, the accrued benefits are insufficient to compensate for the high mobilization costs.

Acquisition Measures. The acquisition of structures represents an alternative to elevation as a nonstructural measure to reduce flood risk, the advantages and disadvantages of which were described previously in this analysis. A comprehensive, stand-alone plan to potentially acquire all 4,219 residential structures within the 25-year floodplain was conducted but not determined to be economically justified. A comparison of the relative merits of acquisition, as measured by net benefits, to elevation of residential structures was conducted on a structure-by-structure basis. Given the practical limitation of the HEC-FDA to conduct benefit analysis on a structure-by-structure basis on this scale, an alternative method was used to extract data from FDA's "struc.detail.out" file in order to derive approximate estimates of damages and damages reduced within a spreadsheet environment. This task was accomplished by manually calculating for each structure the expected annual damages using the damage-probability event table. Adjustment factors were also applied to account for the lack of risk and uncertainty and the effects of sea-level rise.

The economic benefits associated with acquisition were measured as the without-project flood damage which is eliminated by removing the property from the 25-year floodplain. Acquisition costs were based on information developed in coordination with Real Estate Division in July 2013 as the screening on nonstructural plans commenced. Based on this information, costs associated with this acquisition included the depreciated replacement cost of the structure plus $60,000 as estimated for the Uniform Relocations Act, $30,000 for Supervision and Administration, and $70,000 for Lands. This adds an additional $160,000 to the depreciated structure value. No other costs, such as condemnation costs, were included given the current uncertainty in the future scope of application. Economic justification was determined by comparing the expected annual benefits to the expected annual costs. Net benefits were calculated by subtracting the expected annual costs from the expected annual benefits.

In the 2025 25-year floodplain, none of the 4,219 residential structures had higher net benefits from being acquired compared to elevation as a nonstructural measure. As a result, a decision was made that structure acquisition would not be included among nonstructural measures further considered for recommendation apart from the six structures already identified due to engineering constraints.

Subsequent to this analysis, updates to the estimates of Uniform Relocations Act costs and Supervision and Administration costs were developed by Real Estate Division in November 2014. While these updates are not captured in the cost of acquisition in the economic analysis, the net difference is higher by $13,000 per structure. Since this cost applies to only the 6 structures identified for acquisition in the economic analysis, the difference in total project costs is sufficiently small such that there is no change in either the benefit-to-cost ratio or the rounded estimate of average annual costs for the recommended plan as a whole.

NED RECOMMENDED PLAN

Structural and Nonstructural Alternative. The structural alternatives were not found to be economically justified. However, the nonstructural alternatives of elevating 4,213 residential structures, acquisition of 6 residential structures, floodproofing 396 non-residential structures, and constructing berms for 337 warehouses in the 2025 0-25 year floodplain were found to be economically justified, as indicated in Table 43d. As a result, this alternative is the NED recommended plan.

RISK ANALYSIS

Benefit Exceedance Probability Relationship. The HEC-FDA model used the uncertainty surrounding the economic and engineering inputs to generate results that can be used to assess the performance of the project alternatives. Table 44 shows the equivalent annual benefits at the 75, 50, and 25 percentiles. These percentiles reflect the percentage chance that the benefits will be greater than or equal to the indicated values. The benefit exceedance probability relationship for each of the project alternatives can be compared to the point estimate of the average annual costs for each of the project alternatives. The table indicates the percent chance that the equivalent annual benefits will exceed the equivalent annual costs. For the collection of nonstructural measures that are applied to structures in the 25-year floodplain for the year 2025, there is a greater than 75 percent chance that the project benefits exceed the project costs.

Residual Risk and Public Safety. Residual risk is described with respect to the remaining flood risk subsequent to the implementation of the recommended plan, when compared to the future without-project condition. The results of the HEC-FDA model show flood risk under the without-project condition as equivalent annual damages of $474,998,000 (Table 16 at FY 2015 price levels). This figure includes all 51,857 structures in the study area, including automobiles, which are exposed to increased flood risk over the period of analysis due to sea level rise. Only a portion of this inventory would have received flood risk reduction in any of the six structural plans considered. Equivalent annual without-project damages for structures otherwise protected by levee alignments total approximately $319,240,000 (based on Tables 22-39 for each of the levee plan levels of risk reduction at FY 2015 price levels) which represents approximately 67 percent of that for the total study area. This represents the maximum benefits that could be achieved if, in the unlikely event, that levee plans were completely effective in removing all flood risk from the protected area; in this case, residual risk would represent equivalent with-project damages, or a maximum of $155,758,000. But since no structural plans were found to be economically justified or recommended, no discussion is included in this section to further identify residual risk associated with levees.

To evaluate a potential nonstructural recommended plan that performs up to a target of level of risk reduction of 100-years under 2025 conditions, expected without-project damages were recomputed. This recomputation was required to accurately describe the expected future without-project damages for a subset of the study area structure inventory, excluding those structures and vehicles with first floor elevations at or above the 0.01 ACE. These structures would not be included among the potentially benefiting structures since they currently exceed the target level of minimum risk exposure. Without-project expected annual damages for structures (less vehicles) confined to the 100-year floodplain was estimated to be $323,846,000 (Table 43a—2012 prices). It should be noted that this estimate is for 2025 hydrologic conditions only.

With existing information, the total number of additional residential structures, for example, that will enter the 100-year flood zone over the succeeding 50-years can be determined. This change is attributable only to the expected change in stages associated with relative sea level rise. For these structures, the number of feet of structure elevation required to achieve the 2075 100-year stage cannot be higher than the change in the 100-year stage between 2025 and 2075, which is approximately, and on average, 2 feet. Based on the economic evaluations completed to date and the high mobilization cost for the elevation-in-place technique, the economic justification for the elevation measure is nonexistent for such nominally small increments. Therefore, no estimate of 'equivalent' annual damages was made for the nonstructural analysis.

As shown in Table 14, expected annual without-project damages in 2025 for the study area as a whole is $370,155,000 at FY 2015 price levels. This is equal to 357,374,000 at 2012 price levels. This figure includes both structures and vehicles. Given that without-project damages in the 100-year floodplain under 2025 conditions is $323,846,000 (2012 prices), 90.1 percent of all expected without-project damages in 2025 in the study area is associated with inventory located within the 100-year floodplain.

As previously indicated, structures within the 100-year floodplain (2025 conditions—2012 price levels) were evaluated incrementally: (0-25)-year floodplain; (25-50)-year floodplain; and (50-100)-year floodplain. Without-project expected annual damages for the 100-year floodplain, as previously indicated in Table 43a, are $323,846,000 and expected without-project damages for the (0-25)-year floodplain is expected to be $272,288,000, or approximately 84 percent of the total. Implementation of the recommended plan, (0-25)-year floodplain, reduces expected damages to $27,776,000 for the 100-year floodplain (see Table 43b). This residual risk suggests a reduction in damages within the 100-year floodplain by approximately 86 percent.

For the study area as a whole, expected without-project damages are $357,374,000 at 2012 prices and with the recommended plan in place, expected annual damages decline to $ 61,304,000 ($27,776,000 plus the difference between $357,374,000 and $323,846,000). Residual damages under 2025 conditions, again at 2012 price levels, are thus $61.3 million annually, a reduction of approximately 83 percent, indicating a highly effective plan.

By and large, flood risk management projects positively contribute to public safety. This is particularly true for structural plans where, for the most frequent flood events, the incidence of inundation are reduced for communities and other developed areas. However, for less frequent and more severe flood events in coastal areas that are characteristic of the study area, structural plans could have a negative effect on public safety. This may arise from some among the public who do not abide by mandatory evacuation orders in advance of an approaching storm, but who otherwise would, believing that the structural levee may provide greater protection from storm surge that may be warranted. Thus the total population exposed to flooding in the event of overtopping or breach could be greater under with-project conditions. However, for nonstructural plans, no change is expected in evacuation behavior since the potential exaggerated expectations of performance afforded to structural measures is not present, and awareness of flood risk is not abated.

FURTHER CONSIDERATIONS

Refinement of Future Conditions Inventory. Of the 4,952 structures in the 0 to 25-year floodplain, 2,581 (52%) are also in 0 to 10-year floodplain. Structures in this floodplain (0 to 10-year) are exposed to the highest flood risk of all those that were inventoried in the study area. By definition, the frequency of flooding—on a probabilistic basis—is the highest among those in the TSP. In addition, they are most likely to sustain significant damage (greater than 50 percent of the depreciated structure value) for a single flood event.

For all flood risk management studies using the certified HEC-FDA model as the tool of analysis, flood risk is evaluated using statistical probability methods. This highlights what is evident for the purpose of estimating flood damages that occur in the future: the timing, location, and severity of specific flood events are not known. Because specific flood events cannot be predicted using current analytical tools, the expected value of future flood damages can only be estimated on the basis of the expected value of damages for the full range of specific events and weighted by the probability of occurrence.

For structures that reside in particularly high-risk areas, such as the 0 to 10-year floodplain, it is reasonable to expect that the inventory of structures in that area to change over time under the most likely future without-project condition. Incidence of flood events occurring closely together or by single-event severe flooding, while not predictable, on average, has a higher chance of occurring in the 0 to 10-year floodplain. For this reason, some indefinite number of structures would be expected to change their location within the study area over time. This means that the owners of structures would undertake some mitigation of their own under without-project conditions. Mitigation options include structure elevation, relocation, evacuation, "dry floodproofing," and small berms. These options are the same as those considered under with-project conditions.

In absence of any change to the first floor elevations, or other characteristics, associated with structures used as input to the HEC-FDA model to reflect the reasonable expectation of an undetermined degree of adjustment to future flood risk through mitigation activities, the estimate of future without-project damages is likely overestimated. Yet, it is also reasonable to expect that, despite the high flood hazard, not all structures in the 0 to 10-year floodplain would be subject to effective mitigation activities such that, over time, no structures would remain. Predicting which specific structures are mitigated and those that are not again presumes foreknowledge of future flood events which does not exist.

NATIONAL ECOSYSTEM RESTORATION (NER)

Background. The purpose of the Southwest Coastal National Ecosystem Restoration (NER) plan is to reduce the risks associated with habitat damage via saltwater intrusion, shoreline retreat, and loss of geomorphologic infrastructure. This result would contribute towards achieving and sustaining a larger coastal ecosystem that can support and protect the environment, economy, and culture of southern Louisiana and thus contribute to the economy and well-being of the Nation.

Alternatives and Nomenclature. The final array of alternatives consists of twenty-seven plans (Table 45). The array consists of combinations of measures to be implemented in the Calcasieu and Mermentau Basins exclusively and in concert. Furthermore, plans that contained the salinity control gate in the Calcasieu Ship Channel in the initial array were also examined without the gate. The "C" plans are combinations of measures to be implemented in the Calcasieu Basin. The "M" plans are combinations of measures to be implemented in the Mermentau Basin. The "A" plan is the salinity control gate in the Calcasieu Ship Channel; it was analyzed as a standalone plan and as a component measure in other plans. The numbers one through six represents unique combinations of measures.

Cost-effectiveness and Incremental Cost Analysis. ER 1105-2-100 requires that the NER outputs of ecosystem restoration plans be expressed in non-monetary units. Since the combination of costs and benefits of ecosystem restoration plans cannot be expressed in a common metric, cost effectiveness and incremental cost analysis are employed as a means of comparing alternatives. A plan is cost effective if no other alternative plan provides the same level of output for less cost and if no other alternative plan provides more output for the same or less cost. The subset of cost effective plans that are superior financial investments are identified through incremental cost analysis. These "best buys" are the most efficient plans at producing the output variable, providing the greatest increase in the value of the output variable for the least increase in the value of the cost variable. The first best buy is the most efficient plan. It produces output at the lowest incremental cost per unit of output, which, for the first best buy, is equal to the lowest average cost. The next best buy is the most efficient plan for producing additional output, and each subsequent best buy can be ranked based on the same process.

Model Overview. The IWR Planning Suite is a certified decision support model used to assist with the formulation and comparison of alternative plans, primarily with environmental restoration and watershed planning studies. Specifically the model performs cost effectiveness and incremental cost analysis. The IWR Planning Suite was developed within the US Army Corps of Engineers' Investment and Management Decision Making Research Program, conducted by the Corps Institute for Water Resources (IWR).

Cost and Output. Costs were refined given greater detail with respect to the construction cost schedule that allows the incorporation of interest during construction. Construction costs were compounded up to the base year of 2025 and operations and m

Maintenance costs were discounted back to the base year of 2025 using the Federal discount rate for FY 2014 of 3.375 percent. The project costs were then annualized over a 50-year period. For the measures including the salinity control structures in the Calcasieu Ship Channel (Plan A), average annual navigation delay cost of $10,000,000 was included. The output metric used in this analysis was net average annual habitat units (AAHUs). A modified analysis was performed that provided an alternate summary of AAHUs for all component measures considered.

Results. Table 46 displays the average annual cost and net AAHUs for each plan. Among these, there are eleven cost-effective alternatives not including the no-action alternative. Of the eleven cost-effective plans, seven alternatives are best buys. Both the cost effective plans and best buy plans are displayed in Table 47. Figure 1, an output of the IWR-PLANNING SUITE, shows the cost-efficiency frontier curve of the cost-effective alternatives. At each point on the curve, which represents a cost-effective plan, no other plans yielded the same or more output for the same or lower cost. Figure 2 shows the incremental cost per unit of output. Plan C-4 is the most efficient plan, yielding the lowest average cost per unit of output. However, Plan CM-4 was selected as the recommended plan.

See Table 48 for the cost schedule associated with the recommended plan. Since navigation delay costs represent a resource commitment for implementation of this plan, details of this cost is also presented in Table 48. Table 49 displays the derivation of the average annual cost for the recommended plan.

REGIONAL ECONOMIC DEVELOPMENT (RED) IMPACTS

Background. The regional economic development (RED) effects of implementing nonstructural measures, for the purpose of flood risk reduction, in the 0-25 year 2025 floodplain were examined. The nonstructural measures being considered are raising eligible residential structures, dry flood proofing eligible nonresidential structures, and constructing berms to a height of 6 feet. The micropolitan impact area consisting of Cameron, Calcasieu, Vermilion, Jefferson Davis, and Acadia parishes was selected based on the labor market, commuter-shed, and population centers serving the project area. According to RECONS' 2009 data, the population of the study area is 346,000. The number of households is 130,383. Total personal income is $11,655 million (Table 50).

Methodology. This Regional Economic Development (RED) analysis employs input-output economic analysis, which measures the interdependence among industries and workers in an economy. This analysis uses a matrix representation of a region's economy to predict the effect of changes in one industry on others. The greater the interdependence among industry sectors, the larger the multiplier effect on the economy. Changes to government spending drive the input-output model to project new levels of sales (output), value added (GRP), employment, and income for each industry.

The specific input-output model used in this analysis is RECONS (Regional Economic System). This model was developed by the Institute for Water Resources (IWR), Michigan State University, and the Louis Berger Group. RECONS uses industry multipliers derived from the commercial input-output model IMPLAN to estimate the effects that spending on USACE projects has on a regional economy. The model is linear and static, showing relationships and impacts at a certain fixed point in time. Spending impacts are composed of three different effects: direct, indirect, and induced. RECONS is designed to evaluate a discrete spending stimulus, which means that all expenditures occurring over multiple years that are required to complete a project are considered to occur in a single year. Therefore, RECONS is not time-sensitive with respect to the calculation of effects and reporting of outputs. Direct effects represent the impacts the new federal expenditures have on industries which directly support the new project. Labor and construction materials can be considered direct components to the project. Indirect effects represent changes to secondary industries that support the direct industries. Induced effects are changes in consumer spending patterns caused by the change in employment and income within the industries affected by the direct and induced effects. The additional income workers receive via a project may be spent on clothing, groceries, dining out, and other items in the regional area.

The inputs for the RECONS model are expenditures that are entered by work activity or industry sector, each with its own unique production function. The production function "Construction and Major Repairs of Earth Levees" was selected to gauge the impacts of the construction of berms, while "FRM Construction" was selected to gauge the impacts of structure raising and floodproofing. The baseline data used by RECONS to represent the regional economy of Louisiana are annual averages from the Bureau of the Census, the Bureau of Labor Statistics, and the Bureau of Economic Analysis for the year 2009. The model results are expressed in 2012 dollars.

Assumptions. Input-output analysis rests on the following assumptions. The production functions of industries have constant returns to scale, so if output is to increase, inputs will increase in the same proportion. Industries face no supply constraints; they have access to all the materials they can use. Industries have a fixed commodity input structure; they will not substitute any commodities or services used in the production of output in response to price changes. Industries produce their commodities in fixed proportions, so an industry will not increase production of a commodity without increasing production in every other commodity it produces. Furthermore, it is assumed that industries use the same technology to produce all of its commodities. Finally, since the model is static, it is assumed that the economic conditions of 2009, the year of the socioeconomic data in the RECONS model database, will prevail during the years of the construction process.

Description of Metrics. "Output" is the sum total of transactions that take place as a result of the construction project, including both value added and intermediate goods purchased in the economy. "Labor Income" includes all forms of employment income, including employee compensation (wages and benefits) and proprietor income. "Gross Regional Product (GRP)" is the value-added output of the study regions. This metric captures all final goods and services produced in the study areas because of the project's existence. It is different from output in the sense that one dollar of a final good or service may have multiple transactions associated with it. "Jobs" is the estimated worker-years of labor required to build the project.

Results. For the region including the study area, an initial construction stimulus of $383 million would generate 6,671 worker-years of labor, $229,854,304 in labor income, $466,788,778 in output, and $302,629,551 in Gross Regional Product (see Table 51). For the state of Louisiana as a whole, the construction stimulus of $383 million would generate 7,881 worker-years of labor, $290,294,761 in labor income, $624,077,845 in output, and $396,660,720 in Gross Regional Product (see Table 51). The impact area captures about 80% of the direct spending on the project. About 10% of the spending leaks out into other parts of the state of Louisiana. The rest of the nation captures about 9.5%. The secondary impacts, the combined indirect and induced multiplier effects, account for 34% of the total output, about 22% of employment, about 22% of labor income, and 30% of gross regional product in the impact area.

Table 1
Southwest Coastal, LA Feasibility Study
Land Use in the Study Area
(2009)

Land Class Name	Acres	Percentage of Total
Developed land	81,081	3%
Agricultural Land	834,414	32%
Undeveloped Land	1,312,216	51%
Open Water	360,736	14%
Total	2,588,446	100%

Source: National Agricultural Statistical Service

Table 2
Southwest Coastal, LA Feasibility Study
Historical and Projected Parish Population
(1,000s)

Parish	1970	1980	1990	2000	2010	2020	2080
Calcasieu	145.6	168.3	168.3	183.5	187.5	195.0	236.7
Cameron	8.2	9.4	9.2	10.0	6.8	6.6	3.9
Vermillion	43.1	48.7	50.0	54.0	56.7	59.9	76.8
Total	197.0	226.4	227.5	247.4	251.0	261.4	317.4

Source: U.S. Census data, and Moody's County Forecast Database

Table 3
Existing Condition and Projected Population Within
Inventoried Study Area
Southwest Coastal, LA Feasibility Study
(1,000s)

Parish	2010	2025	2075
Total in Study Area	160,596	173,529	224,975

Source: U.S. Census data, and Moody's County Forecast Database
Note: Population estimates assume 2.7 residents based on average houshold size and 20 housing units within a multi family structure.

Table 4
Southwest Coastal, LA Feasibility Study
Existing Condition and Projected Households by Parish
(1,000s)

Parish	1970	1980	1990	2000	2010	2020	2080
Calcasieu	42.1	56.8	60.4	68.6	70.6	76.4	104.5
Cameron	2.3	3.0	3.2	3.6	2.5	2.5	2.3
Vermillion	12.8	16.3	17.8	19.9	21.1	23.1	33.0
Total	57.2	57.2	81.3	92.1	94.2	102.0	139.8

Source: U.S. Census data, and Moody's County Forecast Database

Table 5
Southwest Coastal, LA Feasibility Study
Per Capita Income ($1000s)

Parish	1990	2000	2005	2010	2011
Calcasieu	15,511	23,034	29,021	34,577	36,366
Cameron	13,001	18,433	20,739	33,784	35,114
Vermillion	12,343	19,130	23,091	29,873	30,998

Source: Bureau of Economic Analysis

Table 6
Southwest Coastal, LA Feasibility Study
Total Employment
(1,000s)

Parish	1970	1980	1990	2000	2010	2020	2080
Calcasieu	54.2	80.8	82.2	102.8	106.9	126.3	210.4
Cameron	3.4	5.6	5.5	5.7	4.1	5.0	5.4
Vermillion	14.4	19.3	17.7	20.3	20.9	22.7	31.1
Total	72.0	105.7	105.4	128.8	131.9	154.0	246.9

Source: Bureau of Economic Analysis for years 1980-2010 and projections extrapolated from historical data.

Table 7
Southwest Coastal, LA Feasibility Study
Flood Insurance Claims
Coastal Louisiana

Event	Month/ Year	Number of Paid Claims	Total Amount Paid ($1,000s)
Tropical Storm Juan	Oct-85	6,187	189,842
Hurricane Andrew	Aug-92	5,589	270,791
Tropical Storm Isadore	Sep-02	8,441	141,869
Hurricane Lili	Oct-02	2,563	46,049
Hurricane Katrina	Aug-05	167,099	18,556,254
Hurricane Rita	Sep-05	9,507	539,086
Hurricane Gustav	Sep-08	4,524	115,250
Hurricane Ike	Sep-08	46,137	2,712,969
Hurricane Isaac	Aug-12	7,323	376,270

Source: Federal Emergency Management Agency (FEMA)
Note: Total amount paid and average amount paid have been updated
to the Oct 2012 price level using the CPI for all urban consumers.

Table 8
Southwest Coastal, LA Feasibility Study
FEMA Flood Claims by Parish
1978-2012

Parish	Number of Claims	Total Nominal Dollar Amount ($1,000s)	Average Dollar Amount per Claim ($1,000s)
Calcasieu	5,775	131,973	23
Cameron	3,061	173,494	57
Vermillion	3,218	115,411	36
Total Study Area	12,054	420,878	35

Source: FEMA

Table 9
Southwest Coastal, LA Feasibility Study
Number of Structures Under Existing Conditions
(2012)

Reach Name	Residential	Mobile Home	Non-Residential	Vehicle	Total
Total	38,213	8,647	4,997	67,666	119,523

Note: The table shows the number of structures inventoried within the estimated 500-year overflow for the study area.

Table 10
Southwest Coastal, LA Feasibility Study
Residential and Non-Residential Structure Inventory
Existing Conditions (2012)
(2012 Price Level)

Structure Category	Number	Average Depreciated Replacement Value ($)
	Residential	
One-Story Slab	21,045	154,900
One-Story Pier	15,065	103,850
Two-Story Slab	1,708	236,880
Two-Story Pier	395	168,000
Mobile Home	8,647	13,920
Total Residential	**46,860**	
	Non-Residential	
Eating and Recreation	300	755,020
Professional	932	680,760
Public and Semi-Public	603	1,404,530
Repair and Home Use	133	563,060
Retail and Personal Services	635	817,020
Warehouse	1,565	370,640
Grocery and Gas Station	138	494,890
Multi-Family Occupancy	631	898,350
Industrial	60	100,558,900
Total Non-Residential	**4,997**	

Table 11
Southwest Coastal, LA Feasibility Study
Number of Projected Residential and Non-Residential Structures

Future Conditions (2025)	
Structure Category	Number
Residential	
One-Story Slab	1,685
One-Story Pier	1,205
Two-Story Slab	136
Two-Story Pier	32
Mobile Home	692
Total Residential	**3,750**
Non-Residential	
Eating and Recreation	24
Professional	11
Public and Semi-Public	47
Repair and Home Use	76
Retail and Personal Services	50
Warehouse	11
Grocery and Gas Station	125
Multi-Family Occupancy	52
Industrial	0
Total Non-Residential	**396**
Future Conditions (2075)	
Structure Category	Number
Residential	
One-Story Slab	6,734
One-Story Pier	4,821
Two-Story Slab	547
Two-Story Pier	125
Mobile Home	2,767
Total Residential	**14,994**
Non-Residential	
Eating and Recreation	95
Professional	43
Public and Semi-Public	193
Repair and Home Use	298
Retail and Personal Services	202
Warehouse	45
Grocery and Gas Station	501
Multi-Family Occupancy	203
Industrial	0
Total Non-Residential	**1,580**

Table 12
Southwest Coastal, LA Feasibility Study
Content-to-Structure Value Ratios (CSVR) and Standard Deviations (SD)
by Structure Category

Structure Category		(CSVR, SD)
Residential	One-story (1STY-PIER/1STY-SLAB)	(0.72,0.23)
	Two-story (2STY-PIER/2STY-SLAB)	(0.51,0.28)
	Mobile home (MOBHOM)	(1.42,0.65)
Non-Residential	Eating and Recreation (EAT)	(3.19,4.60)
	Groceries and Gas Stations (GROC)	(1.31,0.98)
	Professional Buildings (PROF)	(0.76,0.71)
	Public and Semi-Public Buildings (PUBL)	(0.84,1.06)
	Multi-Family Buildings (MULT)	(0.24,0.13)
	Repair and Home Use (REPA)	(2.33,2.00)
	Retail and Personal Services (RETA)	(1.40,1.01)
	Warehouses and Contractor Services (WARE)	(2.93,3.56)

Source: Based on the report entitled *Depth-Damage Relationships for Structures, Contents, and Vehicles and Content-to-Structure Value Ratios (CSVR) in Support of the Lower Atchafalaya and Morganza to the Gulf, Louisiana, Feasibility Study* .

Table 13
Southwest Coastal, LA Feasibility Study
Depth-Damage Relationships for Structures, Contents and Vehicles

Occupancy Type	Category Name	Damage Type	Parameter																				
1STY-PIER	Residential		Stage	-1.1	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0
		Structure	Mean %	0.0	1.1	12.2	15.2	49.4	50.1	66.7	70.2	71.2	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5	97.5
			Lower %	0.0	1.0	11.9	13.7	44.4	45.1	60.0	63.2	64.1	87.7	87.7	87.7	87.7	87.7	87.7	87.7	87.7	87.7	87.7	87.7
			Upper %	0.0	1.7	18.3	22.8	74.0	75.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
		Contents	Mean %	0.0	0.0	0.0	0.0	95.0	95.0	95.0	95.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0
			Lower %	0.0	0.0	0.0	0.0	90.0	90.0	95.0	95.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0
			Upper %	0.0	0.0	0.0	0.0	98.0	98.0	98.0	98.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1STY-SLAB	Residential		Stage	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
		Structure	Mean %	0.0	1.1	1.1	23.3	23.3	37.2	41.9	45.3	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0
			Lower %	0.0	1.0	1.0	21.0	21.0	35.5	37.7	40.8	82.8	82.8	82.8	82.8	82.8	82.8	82.8	82.8	82.8	82.8	82.8	82.8
			Upper %	0.0	1.7	1.7	35.0	35.0	55.9	62.9	68.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
		Contents	Mean %	0.0	0.0	0.0	0.0	95.0	95.0	95.0	95.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0
			Lower %	0.0	0.0	0.0	0.0	90.0	90.0	95.0	95.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0	98.0
			Upper %	0.0	0.0	0.0	0.0	98.0	98.0	98.0	98.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2STY-PIER	Residential		Stage	-1.1	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0
		Structure	Mean %	0.0	1.4	2.2	6.4	19.0	19.0	31.9	32.6	33.3	93.4	93.4	93.4	93.4	93.4	93.4	93.6	93.6	93.6	93.6	93.6
			Lower %	0.0	1.2	2.0	5.8	17.1	17.1	28.7	29.3	30.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0	84.0
			Upper %	0.0	2.1	3.3	9.6	28.5	28.5	47.9	48.9	49.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
		Contents	Mean %	0.0	0.0	0.0	0.0	69.6	74.7	74.7	78.5	79.9	83.2	83.2	83.2	83.2	83.2	83.2	97.5	97.8	98.5	98.5	98.5
			Lower %	0.0	0.0	0.0	0.0	66.2	70.9	70.9	74.6	75.9	79.0	79.0	79.0	79.0	79.0	79.0	92.6	92.9	93.6	93.6	93.6
			Upper %	0.0	0.0	0.0	0.0	73.1	78.4	78.4	82.5	83.9	87.3	87.3	87.3	87.3	87.3	87.3	100.0	100.0	100.0	100.0	100.0
2STY-SLAB	Residential		Stage	-1.1	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0
		Structure	Mean %	0.0	1.2	1.2	16.1	16.1	26.1	27.1	28.5	80.0	80.0	80.0	80.0	80.0	80.0	80.3	80.3	80.3	83.2	83.2	83.2
			Lower %	0.0	1.1	1.1	14.5	14.5	23.5	24.4	25.7	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0	72.0
			Upper %	0.0	1.8	1.8	24.2	24.2	39.1	40.7	42.8	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
			Stage	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
		Contents	Mean %	0.0	0.0	0.0	0.0	69.6	74.7	74.7	78.5	79.9	83.2	83.2	83.2	83.2	83.2	83.2	97.5	97.8	98.5	98.5	98.5
			Lower %	0.0	0.0	0.0	0.0	66.2	70.9	70.9	74.6	75.9	79.0	79.0	79.0	79.0	79.0	79.0	92.6	92.9	93.6	93.6	93.6
			Upper %	0.0	0.0	0.0	0.0	73.1	78.4	78.4	82.5	83.9	87.3	87.3	87.3	87.3	87.3	87.3	100.0	100.0	100.0	100.0	100.0
VEHICLES	AUTO		Stage	0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	16.0	17.0
		Structure	Mean %	0.0	0.0	3.7	13.0	46.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
			Lower %	0.0	0.0	2.3	12.0	44.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
			Upper %	0.0	0.0	4.7	15.0	45.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: For the purpose of this table stage is defined as the number of feet above or below the first floor elevation of the structure or automobile.

Table 13 (Cont)
Depth-Damage Relationships for Structures, Contents and Vehicles
Southwest Coastal, LA Feasibility Study

Occupancy Type	Category Name	Damage Type	Parameter																				
EAT	COM		Stage	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
		Structure	Mean %	0.0	0.0	6.6	19.8	19.8	24.5	24.5	29.6	34.7	37.9	37.9	37.9	63.3	63.3	63.3	63.3	63.3	63.3	63.3	63.3
			Lower %	0.0	0.0	6.2	18.4	18.4	22.8	22.8	26.6	31.2	34.1	34.1	34.1	57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0
			Upper %	0.0	0.0	7.6	22.8	22.8	28.2	28.2	37.0	43.4	47.4	47.4	47.4	79.2	79.2	79.2	79.2	79.2	79.2	79.2	79.2
		Contents	Mean %	0.0	0.0	0.0	41.2	45.6	73.3	74.8	92.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
			Lower %	0.0	0.0	0.0	39.2	43.3	69.6	71.1	87.8	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0
			Upper %	0.0	0.0	0.0	51.5	57.0	91.6	93.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
GROC	COM		Stage	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
		Structure	Mean %	0.0	0.0	6.6	19.8	19.8	24.5	24.5	29.6	34.7	37.9	37.9	37.9	63.3	63.3	63.3	63.3	63.3	63.3	63.3	63.3
			Lower %	0.0	0.0	6.2	18.4	18.4	22.8	22.8	26.6	31.2	34.1	34.1	34.1	57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0
			Upper %	0.0	0.0	7.6	22.8	22.8	28.2	28.2	37.0	43.4	47.4	47.4	47.4	79.2	79.2	79.2	79.2	79.2	79.2	79.2	79.2
		Contents	Mean %	0.0	0.0	0.0	99.1	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
			Lower %	0.0	0.0	0.0	94.1	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0
			Upper %	0.0	0.0	0.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MOBHOM	MOBHOME		Stage	-1.1	-1.0	-0.5	0.0	0.5	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
		Structure	Mean %	0.0	6.4	7.3	9.9	43.4	44.7	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6	97.6
			Lower %	0.0	6.1	6.9	9.4	41.2	42.5	92.7	92.7	92.7	92.7	92.7	92.7	92.7	92.7	92.7	92.7	92.7	92.7	92.7	92.7
			Upper %	0.0	8.6	9.8	13.4	58.6	60.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
		Contents	Mean %	0.0	0.0	0.0	95.0	96.0	97.0	98.0	99.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
			Lower %	0.0	0.0	0.0	90.0	92.0	94.0	96.0	98.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
			Upper %	0.0	0.0	0.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
MULT	COM		Stage	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
		Structure	Mean %	0.0	0.0	6.6	19.8	19.8	24.5	24.5	29.6	34.7	37.9	37.9	37.9	63.3	63.3	63.3	63.3	63.3	63.3	63.3	63.3
			Lower %	0.0	0.0	6.2	18.4	18.4	22.8	22.8	26.6	31.2	34.1	34.1	34.1	57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0
			Upper %	0.0	0.0	7.6	22.8	22.8	28.2	28.2	37.0	43.4	47.4	47.4	47.4	79.2	79.2	79.2	79.2	79.2	79.2	79.2	79.2
		Contents	Mean %	0.0	0.0	0.0	20.1	26.2	33.5	42.4	49.8	51.7	51.7	51.7	51.7	51.7	51.7	71.8	85.2	100.0	100.0	100.0	100.0
			Lower %	0.0	0.0	0.0	15.8	22.4	31.2	40.5	46.6	50.3	50.3	50.3	50.3	50.3	50.3	56.4	79.6	93.5	97.1	97.1	97.1
			Upper %	0.0	0.0	0.0	22.2	28.7	35.2	46.2	51.4	53.0	53.1	54.6	54.6	54.6	54.6	79.3	89.5	100.0	100.0	100.0	100.0
PROF	COM		Stage	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
		Structure	Mean %	0.0	0.0	6.6	19.8	19.8	24.5	24.5	29.6	34.7	37.9	37.9	37.9	63.3	63.3	63.3	63.3	63.3	63.3	63.3	63.3
			Lower %	0.0	0.0	6.2	18.4	18.4	22.8	22.8	26.6	31.2	34.1	34.1	34.1	57.0	57.0	57.0	57.0	57.0	57.0	57.0	57.0
			Upper %	0.0	0.0	7.6	22.8	22.8	28.2	28.2	37.0	43.4	47.4	47.4	47.4	79.2	79.2	79.2	79.2	79.2	79.2	79.2	79.2
		Contents	Mean %	0.0	0.0	0.0	35.0	43.3	56.7	63.9	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
			Lower %	0.0	0.0	0.0	30.0	37.1	48.6	54.8	85.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
			Upper %	0.0	0.0	0.0	50.0	61.8	81.0	91.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note: For the purpose of this table stage is defined as the number of feet above or below the first floor elevation of the structure or automobile.

Table 13 (Cont)
Depth-Damage Relationships for Structures, Contents and Vehicles
Southwest Coastal, LA Feasibility Study

PUBL	COM		Stage	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
		Structure	Mean %	0.0	0.0	1.1	22.3	23.7	25.8	32.7	34.4	79.1	79.1	79.1	79.1	79.1	79.1	79.1	79.1	80.5	80.5	80.5	80.5
			Lower %	0.0	0.0	1.1	20.8	22.1	24.0	29.5	31.0	71.2	71.2	71.2	71.2	71.2	71.2	71.2	71.2	72.4	72.4	72.4	72.4
			Upper %	0.0	0.0	1.3	25.7	27.3	29.7	39.3	43.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
		Contents	Mean %	0.0	0.0	0.0	80.0	85.0	85.7	86.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
			Lower %	0.0	0.0	0.0	60.0	63.8	64.3	65.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0	75.0
			Upper %	0.0	0.0	0.0	88.0	93.5	94.2	95.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
REPA	COM		Stage	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
		Structure	Mean %	0.0	0.0	1.1	22.3	23.7	25.8	32.7	34.4	79.1	79.1	79.1	79.1	79.1	79.1	79.1	79.1	80.5	80.5	80.5	80.5
			Lower %	0.0	0.0	1.1	20.8	22.1	24.0	29.5	31.0	71.2	71.2	71.2	71.2	71.2	71.2	71.2	71.2	72.4	72.4	72.4	72.4
			Upper %	0.0	0.0	1.3	25.7	27.3	29.7	39.3	43.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
		Contents	Mean %	0.0	0.0	0.0	33.3	34.3	34.3	69.2	70.6	72.1	80.6	83.7	83.7	83.7	83.7	83.7	83.7	83.7	83.7	83.7	83.7
			Lower %	0.0	0.0	0.0	31.7	32.6	32.6	65.7	67.1	68.5	76.6	79.6	79.6	79.6	79.6	79.6	79.6	79.6	79.6	79.6	79.6
			Upper %	0.0	0.0	0.0	41.7	42.9	42.9	86.5	88.3	90.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
RETA	COM		Stage	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
		Structure	Mean %	0.0	0.0	1.1	22.3	23.7	25.8	32.7	34.4	79.1	79.1	79.1	79.1	79.1	79.1	79.1	79.1	80.5	80.5	80.5	80.5
			Lower %	0.0	0.0	1.1	20.8	22.1	24.0	29.5	31.0	71.2	71.2	71.2	71.2	71.2	71.2	71.2	71.2	72.4	72.4	72.4	72.4
			Upper %	0.0	0.0	1.3	25.7	27.3	29.7	39.3	43.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
		Contents	Mean %	0.0	0.0	0.0	36.6	60.5	60.5	75.4	85.1	94.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
			Lower %	0.0	0.0	0.0	34.8	57.5	57.5	71.6	80.8	89.7	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0	95.0
			Upper %	0.0	0.0	0.0	45.7	75.7	75.7	94.2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
WARE	COM		Stage	-1.0	-0.5	0.0	0.5	1.0	1.5	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0
		Structure	Mean %	0.0	0.0	1.1	22.3	23.7	25.8	32.7	34.4	79.1	79.1	79.1	79.1	79.1	79.1	79.1	79.1	80.5	80.5	80.5	80.5
			Lower %	0.0	0.0	1.1	20.8	22.1	24.0	29.5	31.0	71.2	71.2	71.2	71.2	71.2	71.2	71.2	71.2	72.4	72.4	72.4	72.4
			Upper %	0.0	0.0	1.3	25.7	27.3	29.7	39.3	43.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
		Contents	Mean %	0.0	0.0	0.0	17.6	22.1	22.1	29.2	34.0	42.8	50.8	58.7	66.7	74.6	79.7	79.7	79.7	79.7	79.7	79.7	79.7
			Lower %	0.0	0.0	0.0	16.8	21.0	21.0	27.8	32.3	40.7	48.3	55.8	63.4	70.9	75.7	75.7	75.7	75.7	75.7	75.7	75.7
			Upper %	0.0	0.0	0.0	22.0	27.7	27.7	36.6	42.5	53.6	63.5	73.4	83.4	93.3	99.6	99.6	99.6	99.6	99.6	99.6	99.6

Note: For the purpose of this table stage is defined as the number of feet above or below the first floor elevation of the structure or automobile.

Source: Based on *Depth-Damage Relationships for Structures, Contents, and Vehicles and Content-to-Structure Value Ratios (CSVRs) in Support of the Lower Atchafalaya and Morganza to the Gulf, Louisiana, Feasibility Study Final Report* dated May 1997

Table 14
Southwest Coastal, LA Feasibility Study
Expected Annual Damages (1,000's)
Structures, Contents, and Vehicles
(FY 2015 Price Level)

Analysis Year	Without- Project Damages	Percent Increase from 2012
2012	$ 148,991	
2025	$ 370,155	148%
2075	$ 663,252	345%

Note: Without-project damages increase due to future development and relative sea-level rise. Most of the increase in damages are due to relative sea-level rise since the future development is placed at an elevation equal to or above the stage associated with the 2025 and 2075 0.01 (100-year) annual chance exceedance event.

Table 15
Southwest Coastal, LA Feasibility Study
Number of Structures Receiving Damages By Probability Event in 2025 and 2075
Residential, Commercial, and Mobile Homes
Without-Project Condition

Annual Chance Exceedance Event (ACE)	Residential	Non-Residential	Mobile Home	Total
Base year 2025				
0.99 (1 yr)	538	74	91	703
0.20 (5 yr)	2,161	278	338	2,777
0.10 (10 yr)	4,220	537	646	5,403
0.04 (25 yr)	7,613	945	1,336	9,894
0.02 (50 yr)	11,893	1,425	2,432	15,750
0.01 (100 yr)	17,113	2,199	3,849	23,161
0.005 (200 yr)	19,675	2,637	4,970	27,282
0.002 (500 yr)	23,380	3,228	5,915	32,523
Future year 2075 Intermediate Sea Level Rise				
0.99 (1 yr)	555	78	93	726
0.20 (5 yr)	2,721	433	536	3,690
0.10 (10 yr)	5,466	806	1,147	7,419
0.04 (25 yr)	11,378	1,487	2,940	15,805
0.02 (50 yr)	19,847	2,568	5,141	27,556
0.01 (100 yr)	35,015	4,791	9,515	49,321
0.005 (200 yr)	41,715	5,660	10,291	57,666
0.002 (500 yr)	45,971	6,195	10,949	63,115

Note: The table shows the number of structures with a first floor elevation equal to or less than the stage associated with an ACE event.

Table 16
Southwest Coastal, LA Feasibility Study
Equivalent Annual Without Project Damages by Reach
(FY 2015 Price Level)

Damage Reach Name	Damage Reach Description	Equivalent Annual Damage or Damage Categories				Total Damage
		AUTO	COM	MOBHOME	RES	
SA-001(1)	SA-001	0.07	1.84	0.03	2.43	4.37
SA-006 (7)	SA-006	0.00	0.00	0.00	0.00	0.00
SA-010(19)	SA-010	0.00	0.00	0.00	0.00	0.00
SA-011(22)	SA-011	12.65	1083.89	55.39	420.53	1572.46
SA-012(25)	SA-012	3083.57	45299.90	60.60	85096.52	133540.58
SA-013(28)	SA-013	59.55	878.61	17.31	268.84	1224.32
SA-014(31)	SA-014	37.73	914.28	15.62	134.77	1102.41
SA-015 (34)	SA-015	0.00	0.00	0.00	0.00	0.00
SA-016(37)	SA-016	0.04	0.00	0.00	8.23	8.27
SA-017(40)	SA-017	20.95	206.69	11.72	275.79	515.15
SA-017-RL(43)	SA-017-RL	123.28	2457.04	32.33	1595.68	4208.33
SA-019 (46)	SA-019	0.00	0.00	0.00	0.00	0.00
SA-021(49)	SA-021	4.64	0.00	2.38	0.48	7.50
SA-023(52)	SA-023	11.16	4.66	8.47	26.07	50.36
SA-030(61)	SA-030	74.59	2816.53	37.65	2169.63	5098.40
SA-031(64)	SA-031	45.92	1692.98	50.42	131.24	1920.56
SA-033(70)	SA-033	192.37	1829.91	61.59	3275.48	5359.36
SA-033-RL(73)	SA-033-RL	0.79	98.70	0.05	15.01	114.55
SA-033-RL(76)	SA-033-RL	32.51	196.90	8.24	291.20	528.85
SA-034(79)	SA-034	78.80	1935.29	108.49	641.58	2764.15
SA-036 (82)	SA-036	0.00	0.00	0.00	0.00	0.00
SA-038(85)	SA-038	6.37	0.00	0.00	203.11	209.48
SA-040 (91)	SA-040	0.00	0.00	0.00	0.00	0.00
SA-046(103)	SA-046	10.97	0.00	38.19	1.34	50.50
SA-048(106)	SA-048	1192.40	6391.54	167.35	14250.39	22001.68
SA-054 (112)	SA-054	0.00	0.00	0.00	0.00	0.00
SA-067(130)	SA-067	7.74	0.00	6.20	1.64	15.58
SA-070 (133)	SA-070	0.00	0.00	0.00	0.00	0.00
SA-070-N(136)	SA-070-N	147.75	2801.61	99.19	2427.00	5475.55
SA-070-S(139)	SA-070-S	89.64	7254.43	17.61	1324.32	8686.00
SA-074(151)	SA-074	33.18	117.38	7.94	253.94	412.43
SA-079(166)	SA-079	12.50	48.96	3.56	23.90	88.92
SA-086 (173)	SA-086	0.00	0.00	0.00	0.00	0.00
SA-087 (176)	SA-087	0.00	0.00	0.00	0.00	0.00
SA-089(181)	SA-089	61.56	286.19	16.85	551.67	916.27
SA-090 (184)	SA-090	0.00	0.00	0.00	0.00	0.00
SA-091(187)	SA-091	86.74	4867.87	142.54	478.93	5576.08
SA-092 (190)	SA-092	0.00	0.00	0.00	0.00	0.00
SA-096(202)	SA-096	41.42	921.32	37.21	725.83	1725.78
SA-097 (205)	SA-097	0.00	0.00	0.00	0.00	0.00
SA-099(211)	SA-099	1093.07	34676.35	460.61	4449.02	40679.05
SA-099-RL(214)	SA-099-RL	1098.39	4037.72	1922.26	19836.68	26895.04
SA-100(217)	SA-100	16.88	320.48	10.31	288.35	636.02
SA-101(220)	SA-101	12.55	526.83	2.93	22.15	564.45
SA-104 (232)	SA-104	0.00	0.00	0.00	0.00	0.00
SA-106(238)	SA-106	1577.74	5479.22	306.45	6439.27	13802.67
SA-107 (241)	SA-107	0.00	0.00	0.00	0.00	0.00
SA-111(247)	SA-111	0.00	30.40	0.00	0.00	30.40
SA-112(250)	SA-112	49.04	4490.81	34.02	522.77	5096.65
SA-114 (256)	SA-114	0.00	0.00	0.00	0.00	0.00
SA-115(259)	SA-115	12.22	27.39	6.25	131.45	177.31
XA-304(271)	XA-304	11.88	63.32	9.37	105.50	190.06
XA-304-RL(274)	XA-304-RL	273.71	2035.33	126.82	2826.64	5262.49
XA-305(277)	XA-305	38.01	68.42	23.62	543.03	673.08
XA-306(280)	XA-306	1925.68	22777.87	485.78	16953.65	42142.98
XA-307(283)	XA-307	538.10	2305.96	164.29	9288.22	12296.56

Table 16 (cont.)
Southwest Coastal, LA Feasibility Study
Equivalent Annual Damages by Study Area Reach
(2014 Price Level)

Damage Reach Name	Damage Reach Description	Equivalent Annual Damage or Damage Categories				Total Damage
		AUTO	COM	MOBHOME	RES	
XA-307(283)	XA-307	538.10	2305.96	164.29	9288.22	12296.56
XA-310(292)	XA-310	12.23	20.42	12.81	89.16	134.63
XA-311(295)	XA-311	80.61	2718.63	36.35	1121.18	3956.76
XA-313(301)	XA-313	45.67	1955.06	28.08	540.77	2569.59
XA-315(307)	XA-315	161.09	3672.67	27.89	863.95	4725.60
XA-316(310)	XA-316	23.73	0.00	3.81	261.31	288.84
XA-316-RL(313)	XA-316-RL	55.30	4465.07	12.53	761.90	5294.81
XA-319(322)	XA-319	11.32	136.23	5.67	254.91	408.13
XA-320(325)	XA-320	616.07	31.69	3.32	659.38	1310.46
XA-322(331)	XA-322	7.21	240.18	3.01	222.09	472.49
XA-324(337)	XA-324	279.02	271.61	13.91	3264.78	3829.32
XA-325 (340)	XA-325	0.00	0.00	0.00	0.00	0.00
XA-326(343)	XA-326	10.70	29347.56	0.98	26.47	29385.71
XA-327(346)	XA-327	10.43	104.57	0.00	8.94	123.93
XA-329(352)	XA-329	9.38	455.82	3.14	108.91	577.25
XA-331(358)	XA-331	9.86	0.00	16.91	6.16	32.93
XA-336(373)	XA-336	4.06	732.66	0.02	33.23	769.97
XA-337(376)	XA-337	192.82	5173.48	102.19	2969.31	8437.80
XA-340(385)	XA-340	1842.53	950.76	821.91	20816.65	24431.86
XA-341(388)	XA-341	6.48	257.92	0.00	2.56	266.95
XA-343 (394)	XA-343	0.00	0.00	0.00	0.00	0.00
XA-344 (397)	XA-344	0.00	0.00	0.00	0.00	0.00
XA-346(403)	XA-346	20.42	0.00	53.68	0.00	74.10
XA-347(406)	XA-347	23.75	176.73	23.38	161.18	385.04
XA-347-RL(409)	XA-347-RL	4.65	127.75	16.13	58.41	206.93
XA-348 (412)	XA-348	117.71	1519.85	52.26	843.29	2533.11
XA-348-RL(415)	XA-348-RL	27.63	454.33	49.08	84.67	615.70
XA-349(418)	XA-349	0.00	0.19	0.00	0.00	0.19
XA-350(421)	XA-350	0.00	1.08	0.00	0.00	1.08
XA-351 (424)	XA-351	0.00	0.00	0.00	0.00	0.00
XA-352 (427)	XA-352	0.00	0.00	0.00	0.00	0.00
XA-353(430)	XA-353	1.04	105.80	0.00	1.85	108.69
XA-354(433)	XA-354	0.30	34.93	0.00	5.88	41.11
XA-355(436)	XA-355	5.46	15.48	1.74	507.26	529.94
XA-356(439)	XA-356	975.84	21222.29	293.94	9368.82	31860.89
		16671.48	233139.36	6142.37	219045.28	474998.50

Table 17
Southwest Coastal, LA Feasibility Study
Expected Annual Damages and Estimated Benefits for Six Structural Alternatives (2025)
($1,000s in FY 2015 Price Level)

SWCLA Alternative 2025		0.02 (50-Year) AEP Levee		0.01 (100-year) AEP Levee		0.005 (200-Year) AEP Levee	
	Without project Damages	With project Damages	Benefits	With project Damages	Benefits	With project Damages	Benefits
Abbeville to Delcambre	54,288	40,278	14,010	33,980	20,308	30,694	23,594
Delcambre/Erath	26,886	17,567	9,319	13,359	13,527	11,587	15,299
Abbeville Ring Levee	4,847	4,541	306	4,023	824	3,479	1,368
Lake CharlesWestbankSulfurExtended	6,145	4,124	2,021	2,794	3,351	3,311	2,834
Lake CharlesWestbankSulfurSouthExtended	11,020	10,066	954	9,474	1,546	8,679	2,341
Lake Charles Eastbank	147,655	118,344	29,311	99,930	47,725	99,303	48,352
Total	250,841.00						

Note: With-project damages were adjusted to include rainfall damages that still occur with a levee alternative in place by including rainfall damages associated with the 0.10 (10-year) ACE event.

Table 18

Southwest Coastal, LA Feasibility Study

Expected Annual Damages and Estimated Benefits for Six Structural Alternatives (2075)

($1,000s in FY 2015 Price Level)

SWCLA Alternative 2075		0.02 (50-Year) AEP Levee		0.01 (100-year) AEP Levee		0.005 (200-Year) AEP Levee	
	Without-Project Damages	With-project Damages	Benefits	With-project Damages	Benefits	With-project Damages	Benefits
Abbeville to Delcambre	108,549	74,132	34,417	56,744	51,805	44,537	64,012
Delcambre/Erath	54,311	32,926	21,385	25,562	28,749	23,621	30,690
Abbeville Ring Levee	20,880	17,757	3,123	11,508	9,372	9,564	11,316
Lake CharlesWestbankSulfurExtended	17,750	17,260	490	13,535	4,215	12,335	5,415
Lake CharlesWestbankSulfurSouthExtended	36,272	32,676	3,596	25,322	10,950	20,221	16,051
Lake Charles Eastbank	204,303	170,692	33,611	152,797	51,506	136,296	68,007
Total	442,065.00						

Note: With-project damages were adjusted to include rainfall damages that still occur with a levee alternative in place by including rainfall damages associated with the 0.10 (10-year) ACE event.

Table 19
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.02 AEP for Alternative

Abbebille to Delcambre

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	0.00	1.348	0.00
2016	-8	0.00	1.304	0.00
2017	-7	28.25	1.262	35.64
2018	-6	28.25	1.220	34.48
2019	-5	117.99	1.181	139.29
2020	-4	117.99	1.142	134.74
2021	-3	117.99	1.105	130.34
2022	-2	117.99	1.069	126.08
2023	-1	89.73	1.034	92.76
2024	0	89.73	1.000	89.73
2025	1	0.00	0.967	0.00
2026	2	0.00	0.936	0.00
2027	3	0.00	0.905	0.00
2028	4	0.00	0.876	0.00
2029	5	0.00	0.847	0.00
2030	6	0.00	0.819	0.00
2031	7	0.00	0.793	0.00
2032	8	0.00	0.767	0.00
2033	9	0.00	0.742	0.00
2034	10	0.00	0.718	0.00
2035	11	0.00	0.694	0.00
2036	12	0.00	0.671	0.00
2037	13	0.00	0.650	0.00
2038	14	0.00	0.628	0.00
2039	15	0.00	0.608	0.00
2040	16	0.00	0.588	0.00
2041	17	0.00	0.569	0.00
2042	18	0.00	0.550	0.00
2043	19	0.00	0.532	0.00
2044	20	0.00	0.515	0.00
2045	21	0.00	0.498	0.00
2046	22	0.00	0.482	0.00
2047	23	0.00	0.466	0.00
2048	24	0.00	0.451	0.00
2049	25	0.00	0.436	0.00
2050	26	0.00	0.422	0.00
2051	27	0.00	0.408	0.00
2052	28	0.00	0.395	0.00
2053	29	0.00	0.382	0.00
2054	30	0.00	0.369	0.00
2055	31	0.00	0.357	0.00
2056	32	0.00	0.346	0.00
2057	33	0.00	0.334	0.00
2058	34	0.00	0.323	0.00
2059	35	0.00	0.313	0.00
2060	36	0.00	0.303	0.00
2061	37	0.00	0.293	0.00
2062	38	0.00	0.283	0.00
2063	39	0.00	0.274	0.00
2064	40	0.00	0.265	0.00
2065	41	0.00	0.256	0.00
2066	42	0.00	0.248	0.00
2067	43	0.84	0.240	0.20
2068	44	0.84	0.232	0.20
2069	45	5.55	0.225	1.25
2070	46	5.55	0.217	1.21
2071	47	5.55	0.210	1.17
2072	48	0.00	0.203	0.00
2073	49	0.00	0.197	0.00
2074	50	0.00	0.190	0.00
		726.25		787.08

Interest Rate (%)	0.03375	
Amortization Factor	0.04168	
Interest During Construction		75.15
Average Annual Costs		32.80
O&M Costs ($Millions)		0.51
Total Average Annual Costs ($Millions)		33.31

Table 19 (cont.)
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.02 AEP for Alternative

Delcambre/Erath

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	$0	1.348	0.00
2016	-8	$0	1.304	0.00
2017	-7	15.17	1.262	19.13
2018	-6	15.17	1.220	18.51
2019	-5	52.16	1.181	61.57
2020	-4	52.16	1.142	59.56
2021	-3	52.16	1.105	57.62
2022	-2	52.16	1.069	55.74
2023	-1	36.99	1.034	38.24
2024	0	36.99	1.000	36.99
2025	1	0.00	0.967	0.00
2026	2	0.00	0.936	0.00
2027	3	0.00	0.905	0.00
2028	4	0.00	0.876	0.00
2029	5	0.00	0.847	0.00
2030	6	0.00	0.819	0.00
2031	7	0.00	0.793	0.00
2032	8	0.00	0.767	0.00
2033	9	0.00	0.742	0.00
2034	10	0.00	0.718	0.00
2035	11	0.00	0.694	0.00
2036	12	0.00	0.671	0.00
2037	13	0.00	0.650	0.00
2038	14	0.00	0.628	0.00
2039	15	0.00	0.608	0.00
2040	16	0.00	0.588	0.00
2041	17	0.00	0.569	0.00
2042	18	0.00	0.550	0.00
2043	19	0.00	0.532	0.00
2044	20	0.00	0.515	0.00
2045	21	0.00	0.498	0.00
2046	22	0.00	0.482	0.00
2047	23	0.00	0.466	0.00
2048	24	0.00	0.451	0.00
2049	25	0.00	0.436	0.00
2050	26	0.00	0.422	0.00
2051	27	0.00	0.408	0.00
2052	28	0.00	0.395	0.00
2053	29	0.00	0.382	0.00
2054	30	0.00	0.369	0.00
2055	31	0.00	0.357	0.00
2056	32	0.00	0.346	0.00
2057	33	0.00	0.334	0.00
2058	34	0.00	0.323	0.00
2059	35	0.00	0.313	0.00
2060	36	0.00	0.303	0.00
2061	37	0.00	0.293	0.00
2062	38	0.00	0.283	0.00
2063	39	0.00	0.274	0.00
2064	40	0.00	0.265	0.00
2065	41	0.00	0.256	0.00
2066	42	0.00	0.248	0.00
2067	43	2.13	0.240	0.51
2068	44	2.13	0.232	0.49
2069	45	21.10	0.225	4.74
2070	46	21.10	0.217	4.58
2071	47	0.00	0.210	0.00
2072	48	0.00	0.203	0.00
2073	49	0.00	0.197	0.00
2074	50	0.00	0.190	0.00
		359.42		357.70

Interest Rate (%)	0.03375	
Amortization Factor	0.04168	
Interest During Construction		34.42
Average Annual Costs		14.91
O&M Costs		0.24
Total Average Annual Costs ($ Millions)		15.15

Table 19 (cont.)
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.02 AEP for Alternative

Abbeville Ring Levee

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	$0	1.348	0.00
2016	-8	$0	1.304	0.00
2017	-7	12.91	1.262	16.28
2018	-6	12.91	1.220	15.75
2019	-5	43.45	1.181	51.30
2020	-4	43.45	1.142	49.62
2021	-3	43.45	1.105	48.00
2022	-2	43.45	1.069	46.43
2023	-1	30.54	1.034	31.57
2024	0	30.54	1.000	30.54
2025	1	0.00	0.967	0.00
2026	2	0.00	0.936	0.00
2027	3	0.00	0.905	0.00
2028	4	0.00	0.876	0.00
2029	5	0.00	0.847	0.00
2030	6	0.00	0.819	0.00
2031	7	0.00	0.793	0.00
2032	8	0.00	0.767	0.00
2033	9	0.00	0.742	0.00
2034	10	0.00	0.718	0.00
2035	11	0.00	0.694	0.00
2036	12	0.00	0.671	0.00
2037	13	0.00	0.650	0.00
2038	14	0.00	0.628	0.00
2039	15	0.00	0.608	0.00
2040	16	0.00	0.588	0.00
2041	17	0.00	0.569	0.00
2042	18	0.00	0.550	0.00
2043	19	0.00	0.532	0.00
2044	20	0.00	0.515	0.00
2045	21	0.00	0.498	0.00
2046	22	0.00	0.482	0.00
2047	23	0.00	0.466	0.00
2048	24	0.00	0.451	0.00
2049	25	0.00	0.436	0.00
2050	26	0.00	0.422	0.00
2051	27	0.00	0.408	0.00
2052	28	0.00	0.395	0.00
2053	29	0.00	0.382	0.00
2054	30	0.00	0.369	0.00
2055	31	0.00	0.357	0.00
2056	32	0.00	0.346	0.00
2057	33	0.00	0.334	0.00
2058	34	0.00	0.323	0.00
2059	35	0.00	0.313	0.00
2060	36	0.00	0.303	0.00
2061	37	0.00	0.293	0.00
2062	38	0.00	0.283	0.00
2063	39	0.00	0.274	0.00
2064	40	0.00	0.265	0.00
2065	41	0.00	0.256	0.00
2066	42	0.00	0.248	0.00
2067	43	1.16	0.240	0.28
2068	44	1.16	0.232	0.27
2069	45	11.51	0.225	2.58
2070	46	11.51	0.217	2.50
2071	47	0.00	0.210	0.00
2072	48	0.00	0.203	0.00
2073	49	0.00	0.197	0.00
2074	50	0.00	0.190	0.00
		286.04		295.14

Interest Rate (%)	0.03375	
Amortization Factor	0.04168	
Interest During Construction		28.80
Average Annual Costs		12.30
O&M Costs		0.28
Total Average Annual Costs ($ Millions)		12.58

Table 19 (cont.)
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.02 AEP for Alternative

Lake Charles Westbank Sulphur Extended

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	$0	1.348	0.00
2016	-8	$0	1.304	0.00
2017	-7	5.89	1.262	7.43
2018	-6	5.89	1.220	7.19
2019	-5	21.61	1.181	25.51
2020	-4	21.61	1.142	24.68
2021	-3	21.61	1.105	23.88
2022	-2	21.61	1.069	23.10
2023	-1	15.72	1.034	16.25
2024	0	15.72	1.000	15.72
2025	1	0.00	0.967	0.00
2026	2	0.00	0.936	0.00
2027	3	0.00	0.905	0.00
2028	4	0.00	0.876	0.00
2029	5	0.00	0.847	0.00
2030	6	0.00	0.819	0.00
2031	7	0.00	0.793	0.00
2032	8	0.00	0.767	0.00
2033	9	0.00	0.742	0.00
2034	10	0.00	0.718	0.00
2035	11	0.00	0.694	0.00
2036	12	0.00	0.671	0.00
2037	13	0.00	0.650	0.00
2038	14	0.00	0.628	0.00
2039	15	0.00	0.608	0.00
2040	16	0.00	0.588	0.00
2041	17	0.00	0.569	0.00
2042	18	0.00	0.550	0.00
2043	19	0.00	0.532	0.00
2044	20	0.00	0.515	0.00
2045	21	0.00	0.498	0.00
2046	22	0.00	0.482	0.00
2047	23	0.00	0.466	0.00
2048	24	0.00	0.451	0.00
2049	25	0.00	0.436	0.00
2050	26	0.00	0.422	0.00
2051	27	0.00	0.408	0.00
2052	28	0.00	0.395	0.00
2053	29	0.00	0.382	0.00
2054	30	0.00	0.369	0.00
2055	31	0.00	0.357	0.00
2056	32	0.00	0.346	0.00
2057	33	0.00	0.334	0.00
2058	34	0.00	0.323	0.00
2059	35	0.00	0.313	0.00
2060	36	0.00	0.303	0.00
2061	37	0.00	0.293	0.00
2062	38	0.00	0.283	0.00
2063	39	0.00	0.274	0.00
2064	40	0.00	0.265	0.00
2065	41	0.00	0.256	0.00
2066	42	0.00	0.248	0.00
2067	43	0.60	0.240	0.14
2068	44	0.60	0.232	0.14
2069	45	5.97	0.225	1.34
2070	46	5.97	0.217	1.30
2071	47	0.00	0.210	0.00
2072	48	0.00	0.203	0.00
2073	49	0.00	0.197	0.00
2074	50	0.00	0.190	0.00
		142.81		146.68

Interest Rate	0.03375	
Amortization	0.04168	
Interest During Construction		14.09
Average Annual Costs		6.11
O&M Costs		0.21
Total Average Annual Costs ($Millions)		6.32

Table 19 (cont.)
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.02 AEP for Alternative

Lake Charles Westbank Sulphur South

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015.0	-9.0	0.0	1.3	0.00
2016.0	-8.0	0.0	1.3	0.00
2017.0	-7.0	23.9	1.3	30.12
2018.0	-6.0	23.9	1.2	29.13
2019.0	-5.0	69.5	1.2	82.01
2020.0	-4.0	69.5	1.1	79.33
2021.0	-3.0	69.5	1.1	76.74
2022.0	-2.0	69.5	1.1	74.24
2023.0	-1.0	45.6	1.0	47.13
2024.0	0.0	45.6	1.0	45.60
2025.0	1.0	0.0	1.0	0.00
2026.0	2.0	0.0	0.9	0.00
2027.0	3.0	0.0	0.9	0.00
2028.0	4.0	0.0	0.9	0.00
2029.0	5.0	0.0	0.8	0.00
2030.0	6.0	0.0	0.8	0.00
2031.0	7.0	0.0	0.8	0.00
2032.0	8.0	0.0	0.8	0.00
2033.0	9.0	0.0	0.7	0.00
2034.0	10.0	0.0	0.7	0.00
2035.0	11.0	0.0	0.7	0.00
2036.0	12.0	0.0	0.7	0.00
2037.0	13.0	0.0	0.6	0.00
2038.0	14.0	0.0	0.6	0.00
2039.0	15.0	0.0	0.6	0.00
2040.0	16.0	0.0	0.6	0.00
2041.0	17.0	0.0	0.6	0.00
2042.0	18.0	0.0	0.6	0.00
2043.0	19.0	0.0	0.5	0.00
2044.0	20.0	0.0	0.5	0.00
2045.0	21.0	0.0	0.5	0.00
2046.0	22.0	0.0	0.5	0.00
2047.0	23.0	0.0	0.5	0.00
2048.0	24.0	0.0	0.5	0.00
2049.0	25.0	0.0	0.4	0.00
2050.0	26.0	0.0	0.4	0.00
2051.0	27.0	0.0	0.4	0.00
2052.0	28.0	0.0	0.4	0.00
2053.0	29.0	0.0	0.4	0.00
2054.0	30.0	0.0	0.4	0.00
2055.0	31.0	0.0	0.4	0.00
2056.0	32.0	0.0	0.3	0.00
2057.0	33.0	0.0	0.3	0.00
2058.0	34.0	0.0	0.3	0.00
2059.0	35.0	0.0	0.3	0.00
2060.0	36.0	0.0	0.3	0.00
2061.0	37.0	0.0	0.3	0.00
2062.0	38.0	0.0	0.3	0.00
2063.0	39.0	0.0	0.3	0.00
2064.0	40.0	0.0	0.3	0.00
2065.0	41.0	0.0	0.3	0.00
2066.0	42.0	0.0	0.2	0.00
2067.0	43.0	1.8	0.2	0.43
2068.0	44.0	1.8	0.2	0.42
2069.0	45.0	12.0	0.2	2.69
2070.0	46.0	12.0	0.2	2.60
2071.0	47.0	12.0	0.2	2.51
2072.0	48.0	0.0	0.2	0.00
2073.0	49.0	0.0	0.2	0.00
2074.0	50.0	0.0	0.2	0.00
		456.32		472.95

Interest Rate	0.03375	
Amortization	0.04168	
Interest During Construction		47.49
Average Annual Costs		19.71
O&M Costs		0.44
Total Average Annual Costs ($Millions)		20.16

Table 19 (cont.)
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.02 AEP for Alternative

Lake Charles Eastbank

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	0.00	1.348	0.00
2016	-8	0.00	1.304	0.00
2017	-7	72.83	1.262	91.88
2018	-6	72.83	1.220	88.88
2019	-5	124.68	1.181	147.19
2020	-4	124.68	1.142	142.39
2021	-3	124.68	1.105	137.74
2022	-2	124.68	1.069	133.24
2023	-1	51.86	1.034	53.61
2024	0	51.86	1.000	51.86
2025	1	0.00	0.967	0.00
2026	2	0.00	0.936	0.00
2027	3	0.00	0.905	0.00
2028	4	0.00	0.876	0.00
2029	5	0.00	0.847	0.00
2030	6	0.00	0.819	0.00
2031	7	0.00	0.793	0.00
2032	8	0.00	0.767	0.00
2033	9	0.00	0.742	0.00
2034	10	0.00	0.718	0.00
2035	11	0.00	0.694	0.00
2036	12	0.00	0.671	0.00
2037	13	0.00	0.650	0.00
2038	14	0.00	0.628	0.00
2039	15	0.00	0.608	0.00
2040	16	0.00	0.588	0.00
2041	17	0.00	0.569	0.00
2042	18	0.00	0.550	0.00
2043	19	0.00	0.532	0.00
2044	20	0.00	0.515	0.00
2045	21	0.00	0.498	0.00
2046	22	0.00	0.482	0.00
2047	23	0.00	0.466	0.00
2048	24	0.00	0.451	0.00
2049	25	0.00	0.436	0.00
2050	26	0.00	0.422	0.00
2051	27	0.00	0.408	0.00
2052	28	0.00	0.395	0.00
2053	29	0.00	0.382	0.00
2054	30	0.00	0.369	0.00
2055	31	0.00	0.357	0.00
2056	32	0.00	0.346	0.00
2057	33	0.00	0.334	0.00
2058	34	0.00	0.323	0.00
2059	35	0.00	0.313	0.00
2060	36	0.00	0.303	0.00
2061	37	0.00	0.293	0.00
2062	38	0.00	0.283	0.00
2063	39	0.00	0.274	0.00
2064	40	0.00	0.265	0.00
2065	41	0.00	0.256	0.00
2066	42	0.00	0.248	0.00
2067	43	3.10	0.240	0.74
2068	44	3.10	0.232	0.72
2069	45	20.45	0.225	4.59
2070	46	20.45	0.217	4.44
2071	47	20.45	0.210	4.30
2072	48	0.00	0.203	0.00
2073	49	0.00	0.197	0.00
2074	50	0.00	0.190	0.00
		815.63		861.57

Interest Rate	0.03375	
Amortization	0.04168	
Interest During Construction		98.68
Average Annual Costs		35.91
O&M Costs		0.60
Total Average Annual Costs ($Millions)		36.51

Table 19
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.02 AEP for Alternative

Abbebille to Delcambre

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	0.00	1.348	0.00
2016	-8	0.00	1.304	0.00
2017	-7	30.53	1.262	38.51
2018	-6	30.53	1.220	37.25
2019	-5	143.21	1.181	169.06
2020	-4	143.21	1.142	163.54
2021	-3	143.21	1.105	158.21
2022	-2	143.21	1.069	153.04
2023	-1	112.69	1.034	116.49
2024	0	112.69	1.000	112.69
2025	1	0.00	0.967	0.00
2026	2	0.00	0.936	0.00
2027	3	0.00	0.905	0.00
2028	4	0.00	0.876	0.00
2029	5	0.00	0.847	0.00
2030	6	0.00	0.819	0.00
2031	7	0.00	0.793	0.00
2032	8	0.00	0.767	0.00
2033	9	0.00	0.742	0.00
2034	10	0.00	0.718	0.00
2035	11	0.00	0.694	0.00
2036	12	0.00	0.671	0.00
2037	13	0.00	0.650	0.00
2038	14	0.00	0.628	0.00
2039	15	0.00	0.608	0.00
2040	16	0.00	0.588	0.00
2041	17	0.00	0.569	0.00
2042	18	0.00	0.550	0.00
2043	19	0.00	0.532	0.00
2044	20	0.00	0.515	0.00
2045	21	0.00	0.498	0.00
2046	22	0.00	0.482	0.00
2047	23	0.00	0.466	0.00
2048	24	0.00	0.451	0.00
2049	25	0.00	0.436	0.00
2050	26	0.00	0.422	0.00
2051	27	0.00	0.408	0.00
2052	28	0.00	0.395	0.00
2053	29	0.00	0.382	0.00
2054	30	0.00	0.369	0.00
2055	31	0.00	0.357	0.00
2056	32	0.00	0.346	0.00
2057	33	0.00	0.334	0.00
2058	34	0.00	0.323	0.00
2059	35	0.00	0.313	0.00
2060	36	0.00	0.303	0.00
2061	37	0.00	0.293	0.00
2062	38	0.00	0.283	0.00
2063	39	0.00	0.274	0.00
2064	40	0.00	0.265	0.00
2065	41	0.00	0.256	0.00
2066	42	0.00	0.248	0.00
2067	43	1.19	0.240	0.29
2068	44	1.19	0.232	0.28
2069	45	7.87	0.225	1.77
2070	46	7.87	0.217	1.71
2071	47	7.87	0.210	1.65
2072	48	0.00	0.203	0.00
2073	49	0.00	0.197	0.00
2074	50	0.00	0.190	0.00
		885.24		954.48

Interest Rate (	0.03375	
Amortization I	0.04168	
Interest During Construction		89.5
Average Annual Costs		39.8
O&M Costs ($Millions)		0.56
Total Average Annual Costs ($Millions)		40.3

Table 20 (cont.)
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.01 AEP for Alternative

Delcambre/Erath

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	0.00	1.348	0.00
2016	-8	0.00	1.304	0.00
2017	-7	16.66	1.262	21.02
2018	-6	16.66	1.220	20.33
2019	-5	68.78	1.181	81.20
2020	-4	68.78	1.142	78.55
2021	-3	68.78	1.105	75.98
2022	-2	68.78	1.069	73.50
2023	-1	52.12	1.034	53.88
2024	0	52.12	1.000	52.12
2025	1	0.00	0.967	0.00
2026	2	0.00	0.936	0.00
2027	3	0.00	0.905	0.00
2028	4	0.00	0.876	0.00
2029	5	0.00	0.847	0.00
2030	6	0.00	0.819	0.00
2031	7	0.00	0.793	0.00
2032	8	0.00	0.767	0.00
2033	9	0.00	0.742	0.00
2034	10	0.00	0.718	0.00
2035	11	0.00	0.694	0.00
2036	12	0.00	0.671	0.00
2037	13	0.00	0.650	0.00
2038	14	0.00	0.628	0.00
2039	15	0.00	0.608	0.00
2040	16	0.00	0.588	0.00
2041	17	0.00	0.569	0.00
2042	18	0.00	0.550	0.00
2043	19	0.00	0.532	0.00
2044	20	0.00	0.515	0.00
2045	21	0.00	0.498	0.00
2046	22	0.00	0.482	0.00
2047	23	0.00	0.466	0.00
2048	24	0.00	0.451	0.00
2049	25	0.00	0.436	0.00
2050	26	0.00	0.422	0.00
2051	27	0.00	0.408	0.00
2052	28	0.00	0.395	0.00
2053	29	0.00	0.382	0.00
2054	30	0.00	0.369	0.00
2055	31	0.00	0.357	0.00
2056	32	0.00	0.346	0.00
2057	33	0.00	0.334	0.00
2058	34	0.00	0.323	0.00
2059	35	0.00	0.313	0.00
2060	36	0.00	0.303	0.00
2061	37	0.00	0.293	0.00
2062	38	0.00	0.283	0.00
2063	39	0.00	0.274	0.00
2064	40	0.00	0.265	0.00
2065	41	0.00	0.256	0.00
2066	42	0.00	0.248	0.00
2067	43	2.66	0.240	0.64
2068	44	2.66	0.232	0.62
2069	45	17.59	0.225	3.95
2070	46	17.59	0.217	3.82
2071	47	17.59	0.210	3.70
2072	48	0.00	0.203	0.00
2073	49	0.00	0.197	0.00
2074	50	0.00	0.190	0.00
		470.79		469.31

Interest Rate (	0.03375	
Amortization I	0.04168	
Interest During Construction		43.90
Average Annual Costs		19.56
O&M Costs		0.24
Total Average Annual Costs ($ Millions)		19.80

Table 20 (cont.)
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.01 AEP for Alternative

Abbeville Ring Levee

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	0.00	1.348	0.00
2016	-8	0.00	1.304	0.00
2017	-7	13.68	1.262	17.26
2018	-6	13.68	1.220	16.70
2019	-5	52.06	1.181	61.46
2020	-4	52.06	1.142	59.46
2021	-3	52.06	1.105	57.52
2022	-2	52.06	1.069	55.64
2023	-1	38.38	1.034	39.68
2024	0	38.38	1.000	38.38
2025	1	0.00	0.967	0.00
2026	2	0.00	0.936	0.00
2027	3	0.00	0.905	0.00
2028	4	0.00	0.876	0.00
2029	5	0.00	0.847	0.00
2030	6	0.00	0.819	0.00
2031	7	0.00	0.793	0.00
2032	8	0.00	0.767	0.00
2033	9	0.00	0.742	0.00
2034	10	0.00	0.718	0.00
2035	11	0.00	0.694	0.00
2036	12	0.00	0.671	0.00
2037	13	0.00	0.650	0.00
2038	14	0.00	0.628	0.00
2039	15	0.00	0.608	0.00
2040	16	0.00	0.588	0.00
2041	17	0.00	0.569	0.00
2042	18	0.00	0.550	0.00
2043	19	0.00	0.532	0.00
2044	20	0.00	0.515	0.00
2045	21	0.00	0.498	0.00
2046	22	0.00	0.482	0.00
2047	23	0.00	0.466	0.00
2048	24	0.00	0.451	0.00
2049	25	0.00	0.436	0.00
2050	26	0.00	0.422	0.00
2051	27	0.00	0.408	0.00
2052	28	0.00	0.395	0.00
2053	29	0.00	0.382	0.00
2054	30	0.00	0.369	0.00
2055	31	0.00	0.357	0.00
2056	32	0.00	0.346	0.00
2057	33	0.00	0.334	0.00
2058	34	0.00	0.323	0.00
2059	35	0.00	0.313	0.00
2060	36	0.00	0.303	0.00
2061	37	0.00	0.293	0.00
2062	38	0.00	0.283	0.00
2063	39	0.00	0.274	0.00
2064	40	0.00	0.265	0.00
2065	41	0.00	0.256	0.00
2066	42	0.00	0.248	0.00
2067	43	1.45	0.240	0.35
2068	44	1.45	0.232	0.34
2069	45	14.41	0.225	3.23
2070	46	14.41	0.217	3.13
2071	47	0.00	0.210	0.00
2072	48	0.00	0.203	0.00
2073	49	0.00	0.197	0.00
2074	50	0.00	0.190	0.00
		344.11		353.14

Interest Rate (0.03375	
Amortization I 0.04168	
Interest During Construction	33.71
Average Annual Costs	14.72
O&M Costs	0.28
Total Average Annual Costs ($ Millions)	14.99

Table 20 (cont.)
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.01 AEP for Alternative

Lake Charles Westbank Sulphur Extended

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	0.00	1.348	0.00
2016	-8	0.00	1.304	0.00
2017	-7	6.52	1.262	8.22
2018	-6	6.52	1.220	7.95
2019	-5	28.59	1.181	33.75
2020	-4	28.59	1.142	32.65
2021	-3	28.59	1.105	31.59
2022	-2	28.59	1.069	30.56
2023	-1	22.08	1.034	22.82
2024	0	22.08	1.000	22.08
2025	1	0.00	0.967	0.00
2026	2	0.00	0.936	0.00
2027	3	0.00	0.905	0.00
2028	4	0.00	0.876	0.00
2029	5	0.00	0.847	0.00
2030	6	0.00	0.819	0.00
2031	7	0.00	0.793	0.00
2032	8	0.00	0.767	0.00
2033	9	0.00	0.742	0.00
2034	10	0.00	0.718	0.00
2035	11	0.00	0.694	0.00
2036	12	0.00	0.671	0.00
2037	13	0.00	0.650	0.00
2038	14	0.00	0.628	0.00
2039	15	0.00	0.608	0.00
2040	16	0.00	0.588	0.00
2041	17	0.00	0.569	0.00
2042	18	0.00	0.550	0.00
2043	19	0.00	0.532	0.00
2044	20	0.00	0.515	0.00
2045	21	0.00	0.498	0.00
2046	22	0.00	0.482	0.00
2047	23	0.00	0.466	0.00
2048	24	0.00	0.451	0.00
2049	25	0.00	0.436	0.00
2050	26	0.00	0.422	0.00
2051	27	0.00	0.408	0.00
2052	28	0.00	0.395	0.00
2053	29	0.00	0.382	0.00
2054	30	0.00	0.369	0.00
2055	31	0.00	0.357	0.00
2056	32	0.00	0.346	0.00
2057	33	0.00	0.334	0.00
2058	34	0.00	0.323	0.00
2059	35	0.00	0.313	0.00
2060	36	0.00	0.303	0.00
2061	37	0.00	0.293	0.00
2062	38	0.00	0.283	0.00
2063	39	0.00	0.274	0.00
2064	40	0.00	0.265	0.00
2065	41	0.00	0.256	0.00
2066	42	0.00	0.248	0.00
2067	43	1.27	0.240	0.30
2068	44	1.27	0.232	0.29
2069	45	12.58	0.225	2.82
2070	46	12.58	0.217	2.73
2071	47	0.00	0.210	0.00
2072	48	0.00	0.203	0.00
2073	49	0.00	0.197	0.00
2074	50	0.00	0.190	0.00
		199.25		195.78

Interest Rate 0.03375	
Amortization 0.04168	
Interest During Construction	18.06
Average Annual Costs	8.16
O&M Costs	0.21
Total Average Annual Costs ($Millions)	8.36

Table 20 (cont.)
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.01 AEP for Alternative

Lake Charles Westbank Sulphur South

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	0.00	1.348	0.00
2016	-8	0.00	1.304	0.00
2017	-7	25.99	1.262	32.79
2018	-6	25.99	1.220	31.72
2019	-5	93.07	1.181	109.88
2020	-4	93.07	1.142	106.29
2021	-3	93.07	1.105	102.82
2022	-2	93.07	1.069	99.46
2023	-1	67.08	1.034	69.34
2024	0	67.08	1.000	67.08
2025	1	0.00	0.967	0.00
2026	2	0.00	0.936	0.00
2027	3	0.00	0.905	0.00
2028	4	0.00	0.876	0.00
2029	5	0.00	0.847	0.00
2030	6	0.00	0.819	0.00
2031	7	0.00	0.793	0.00
2032	8	0.00	0.767	0.00
2033	9	0.00	0.742	0.00
2034	10	0.00	0.718	0.00
2035	11	0.00	0.694	0.00
2036	12	0.00	0.671	0.00
2037	13	0.00	0.650	0.00
2038	14	0.00	0.628	0.00
2039	15	0.00	0.608	0.00
2040	16	0.00	0.588	0.00
2041	17	0.00	0.569	0.00
2042	18	0.00	0.550	0.00
2043	19	0.00	0.532	0.00
2044	20	0.00	0.515	0.00
2045	21	0.00	0.498	0.00
2046	22	0.00	0.482	0.00
2047	23	0.00	0.466	0.00
2048	24	0.00	0.451	0.00
2049	25	0.00	0.436	0.00
2050	26	0.00	0.422	0.00
2051	27	0.00	0.408	0.00
2052	28	0.00	0.395	0.00
2053	29	0.00	0.382	0.00
2054	30	0.00	0.369	0.00
2055	31	0.00	0.357	0.00
2056	32	0.00	0.346	0.00
2057	33	0.00	0.334	0.00
2058	34	0.00	0.323	0.00
2059	35	0.00	0.313	0.00
2060	36	0.00	0.303	0.00
2061	37	0.00	0.293	0.00
2062	38	0.00	0.283	0.00
2063	39	0.00	0.274	0.00
2064	40	0.00	0.265	0.00
2065	41	0.00	0.256	0.00
2066	42	0.00	0.248	0.00
2067	43	3.24	0.240	0.78
2068	44	3.24	0.232	0.75
2069	45	21.40	0.225	4.81
2070	46	21.40	0.217	4.65
2071	47	21.40	0.210	4.50
2072	48	0.00	0.203	0.00
2073	49	0.00	0.197	0.00
2074	50	0.00	0.190	0.00
		629.12		634.86

Interest Rate	0.03375	
Amortization	0.04168	
Interest During Construction		60.94
Average Annual Costs		26.46
O&M Costs		0.44
Total Average Annual Costs ($Millions)		26.90

Table 20 (cont.)
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.01 AEP for Alternative

Lake Charles Eastbank

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	0.00	1.393	0.00
2016	-8	0.00	1.342	0.00
2017	-7	75.32	1.294	97.46
2018	-6	75.32	1.247	93.94
2019	-5	175.91	1.202	211.46
2020	-4	175.91	1.159	203.82
2021	-3	175.91	1.117	196.45
2022	-2	175.91	1.076	189.35
2023	-1	77.12	1.038	80.01
2024	0	77.12	1.000	77.12
2025	1	0.00	0.964	0.00
2026	2	0.00	0.929	0.00
2027	3	0.00	0.895	0.00
2028	4	0.00	0.863	0.00
2029	5	0.00	0.832	0.00
2030	6	0.00	0.802	0.00
2031	7	0.00	0.773	0.00
2032	8	0.00	0.745	0.00
2033	9	0.00	0.718	0.00
2034	10	0.00	0.692	0.00
2035	11	0.00	0.667	0.00
2036	12	0.00	0.643	0.00
2037	13	0.00	0.620	0.00
2038	14	0.00	0.597	0.00
2039	15	0.00	0.576	0.00
2040	16	0.00	0.555	0.00
2041	17	0.00	0.535	0.00
2042	18	0.00	0.515	0.00
2043	19	0.00	0.497	0.00
2044	20	0.00	0.479	0.00
2045	21	0.00	0.462	0.00
2046	22	0.00	0.445	0.00
2047	23	0.00	0.429	0.00
2048	24	0.00	0.413	0.00
2049	25	0.00	0.398	0.00
2050	26	0.00	0.384	0.00
2051	27	0.00	0.370	0.00
2052	28	0.00	0.357	0.00
2053	29	0.00	0.344	0.00
2054	30	0.00	0.331	0.00
2055	31	0.00	0.319	0.00
2056	32	0.00	0.308	0.00
2057	33	0.00	0.297	0.00
2058	34	0.00	0.286	0.00
2059	35	0.00	0.276	0.00
2060	36	0.00	0.266	0.00
2061	37	0.00	0.256	0.00
2062	38	0.00	0.247	0.00
2063	39	0.00	0.238	0.00
2064	40	0.00	0.229	0.00
2065	41	0.00	0.221	0.00
2066	42	0.00	0.213	0.00
2067	43	4.62	0.205	0.95
2068	44	4.62	0.198	0.91
2069	45	30.49	0.191	5.82
2070	46	30.49	0.184	5.61
2071	47	30.49	0.177	5.40
2072	48	0.00	0.171	0.00
2073	49	0.00	0.165	0.00
2074	50	0.00	0.159	0.00
		1109.22		1,168.31

Interest Rate	0.03375	
Amortization	0.04168	
Interest During Construction		141.09
Average Annual Costs		48.69
O&M Costs		0.60
Total Average Annual Costs ($Millions)		49.30

Note: Includes Mitigation costs.

Table 21
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.005 AEP for Alternative

Abbeville to Delcambre

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	0.00	1.348	0.00
2016	-8	0.00	1.304	0.00
2017	-7	33.90	1.262	42.77
2018	-6	33.90	1.220	41.37
2019	-5	180.66	1.181	213.27
2020	-4	180.66	1.142	206.31
2021	-3	180.66	1.105	199.57
2022	-2	180.66	1.069	193.06
2023	-1	146.76	1.034	151.71
2024	0	146.76	1.000	146.76
2025	1	0.00	0.967	0.00
2026	2	0.00	0.936	0.00
2027	3	0.00	0.905	0.00
2028	4	0.00	0.876	0.00
2029	5	0.00	0.847	0.00
2030	6	0.00	0.819	0.00
2031	7	0.00	0.793	0.00
2032	8	0.00	0.767	0.00
2033	9	0.00	0.742	0.00
2034	10	0.00	0.718	0.00
2035	11	0.00	0.694	0.00
2036	12	0.00	0.671	0.00
2037	13	0.00	0.650	0.00
2038	14	0.00	0.628	0.00
2039	15	0.00	0.608	0.00
2040	16	0.00	0.588	0.00
2041	17	0.00	0.569	0.00
2042	18	0.00	0.550	0.00
2043	19	0.00	0.532	0.00
2044	20	0.00	0.515	0.00
2045	21	0.00	0.498	0.00
2046	22	0.00	0.482	0.00
2047	23	0.00	0.466	0.00
2048	24	0.00	0.451	0.00
2049	25	0.00	0.436	0.00
2050	26	0.00	0.422	0.00
2051	27	0.00	0.408	0.00
2052	28	0.00	0.395	0.00
2053	29	0.00	0.382	0.00
2054	30	0.00	0.369	0.00
2055	31	0.00	0.357	0.00
2056	32	0.00	0.346	0.00
2057	33	0.00	0.334	0.00
2058	34	0.00	0.323	0.00
2059	35	0.00	0.313	0.00
2060	36	0.00	0.303	0.00
2061	37	0.00	0.293	0.00
2062	38	0.00	0.283	0.00
2063	39	0.00	0.274	0.00
2064	40	0.00	0.265	0.00
2065	41	0.00	0.256	0.00
2066	42	0.00	0.248	0.00
2067	43	1.56	0.240	0.37
2068	44	1.56	0.232	0.36
2069	45	10.28	0.225	2.31
2070	46	10.28	0.217	2.23
2071	47	10.28	0.210	2.16
2072	48	0.00	0.203	0.00
2073	49	0.00	0.197	0.00
2074	50	0.00	0.190	0.00
		1117.89		1,202.25

Interest Rate (	0.03375	
Amortization	0.04168	
Interest During Construction		110.87
Average Annual Costs		50.11
O&M Costs ($Millions)		0.56
Total Average Annual Costs ($Millions)		50.67

Table 21 (cont.)
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.005 AEP for Alternative

Delcambre/Erath

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	0.00	1.348	0.00
2016	-8	0.00	1.304	0.00
2017	-7	18.27	1.262	23.05
2018	-6	18.27	1.220	22.30
2019	-5	86.68	1.181	102.33
2020	-4	86.68	1.142	98.98
2021	-3	86.68	1.105	95.75
2022	-2	86.68	1.069	92.63
2023	-1	68.40	1.034	70.71
2024	0	68.40	1.000	68.40
2025	1	0.00	0.967	0.00
2026	2	0.00	0.936	0.00
2027	3	0.00	0.905	0.00
2028	4	0.00	0.876	0.00
2029	5	0.00	0.847	0.00
2030	6	0.00	0.819	0.00
2031	7	0.00	0.793	0.00
2032	8	0.00	0.767	0.00
2033	9	0.00	0.742	0.00
2034	10	0.00	0.718	0.00
2035	11	0.00	0.694	0.00
2036	12	0.00	0.671	0.00
2037	13	0.00	0.650	0.00
2038	14	0.00	0.628	0.00
2039	15	0.00	0.608	0.00
2040	16	0.00	0.588	0.00
2041	17	0.00	0.569	0.00
2042	18	0.00	0.550	0.00
2043	19	0.00	0.532	0.00
2044	20	0.00	0.515	0.00
2045	21	0.00	0.498	0.00
2046	22	0.00	0.482	0.00
2047	23	0.00	0.466	0.00
2048	24	0.00	0.451	0.00
2049	25	0.00	0.436	0.00
2050	26	0.00	0.422	0.00
2051	27	0.00	0.408	0.00
2052	28	0.00	0.395	0.00
2053	29	0.00	0.382	0.00
2054	30	0.00	0.369	0.00
2055	31	0.00	0.357	0.00
2056	32	0.00	0.346	0.00
2057	33	0.00	0.334	0.00
2058	34	0.00	0.323	0.00
2059	35	0.00	0.313	0.00
2060	36	0.00	0.303	0.00
2061	37	0.00	0.293	0.00
2062	38	0.00	0.283	0.00
2063	39	0.00	0.274	0.00
2064	40	0.00	0.265	0.00
2065	41	0.00	0.256	0.00
2066	42	0.00	0.248	0.00
2067	43	3.18	0.240	0.76
2068	44	3.18	0.232	0.74
2069	45	21.02	0.225	4.72
2070	46	21.02	0.217	4.57
2071	47	21.02	0.210	4.42
2072	48	0.00	0.203	0.00
2073	49	0.00	0.197	0.00
2074	50	0.00	0.190	0.00
		589.49		589.36

Interest Rate (	0.03375	
Amortization I	0.04168	
Interest During Construction		54.10
Average Annual Costs		24.56
O&M Costs		0.24
Total Average Annual Costs ($ Millions)		24.81

Table 21 (cont.)
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.005 AEP for Alternative

Abbeville Ring Levee

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	0.00	1.348	0.00
2016	-8	0.00	1.304	0.00
2017	-7	15.10	1.262	19.05
2018	-6	15.10	1.220	18.43
2019	-5	67.81	1.181	80.05
2020	-4	67.81	1.142	77.44
2021	-3	67.81	1.105	74.91
2022	-2	67.81	1.069	72.46
2023	-1	52.71	1.034	54.49
2024	0	52.71	1.000	52.71
2025	1	0.00	0.967	0.00
2026	2	0.00	0.936	0.00
2027	3	0.00	0.905	0.00
2028	4	0.00	0.876	0.00
2029	5	0.00	0.847	0.00
2030	6	0.00	0.819	0.00
2031	7	0.00	0.793	0.00
2032	8	0.00	0.767	0.00
2033	9	0.00	0.742	0.00
2034	10	0.00	0.718	0.00
2035	11	0.00	0.694	0.00
2036	12	0.00	0.671	0.00
2037	13	0.00	0.650	0.00
2038	14	0.00	0.628	0.00
2039	15	0.00	0.608	0.00
2040	16	0.00	0.588	0.00
2041	17	0.00	0.569	0.00
2042	18	0.00	0.550	0.00
2043	19	0.00	0.532	0.00
2044	20	0.00	0.515	0.00
2045	21	0.00	0.498	0.00
2046	22	0.00	0.482	0.00
2047	23	0.00	0.466	0.00
2048	24	0.00	0.451	0.00
2049	25	0.00	0.436	0.00
2050	26	0.00	0.422	0.00
2051	27	0.00	0.408	0.00
2052	28	0.00	0.395	0.00
2053	29	0.00	0.382	0.00
2054	30	0.00	0.369	0.00
2055	31	0.00	0.357	0.00
2056	32	0.00	0.346	0.00
2057	33	0.00	0.334	0.00
2058	34	0.00	0.323	0.00
2059	35	0.00	0.313	0.00
2060	36	0.00	0.303	0.00
2061	37	0.00	0.293	0.00
2062	38	0.00	0.283	0.00
2063	39	0.00	0.274	0.00
2064	40	0.00	0.265	0.00
2065	41	0.00	0.256	0.00
2066	42	0.00	0.248	0.00
2067	43	1.87	0.240	0.45
2068	44	1.87	0.232	0.43
2069	45	18.57	0.225	4.17
2070	46	18.57	0.217	4.03
2071	47	0.00	0.210	0.00
2072	48	0.00	0.203	0.00
2073	49	0.00	0.197	0.00
2074	50	0.00	0.190	0.00
		447.74		458.63

Interest Rate (	0.03375	
Amortization I	0.04168	
Interest During Construction		42.68
Average Annual Costs		19.11
O&M Costs		0.28
Total Average Annual Costs ($ Millions)		19.39

Table 21 (cont.)
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.005 AEP for Alternative

Lake Charles Westbank Sulphur Extended

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	0.00	1.348	0.00
2016	-8	0.00	1.304	0.00
2017	-7	8.17	1.262	10.31
2018	-6	8.17	1.220	9.98
2019	-5	47.02	1.181	55.51
2020	-4	47.02	1.142	53.70
2021	-3	47.02	1.105	51.95
2022	-2	47.02	1.069	50.25
2023	-1	38.85	1.034	40.16
2024	0	38.85	1.000	38.85
2025	1	0.00	0.967	0.00
2026	2	0.00	0.936	0.00
2027	3	0.00	0.905	0.00
2028	4	0.00	0.876	0.00
2029	5	0.00	0.847	0.00
2030	6	0.00	0.819	0.00
2031	7	0.00	0.793	0.00
2032	8	0.00	0.767	0.00
2033	9	0.00	0.742	0.00
2034	10	0.00	0.718	0.00
2035	11	0.00	0.694	0.00
2036	12	0.00	0.671	0.00
2037	13	0.00	0.650	0.00
2038	14	0.00	0.628	0.00
2039	15	0.00	0.608	0.00
2040	16	0.00	0.588	0.00
2041	17	0.00	0.569	0.00
2042	18	0.00	0.550	0.00
2043	19	0.00	0.532	0.00
2044	20	0.00	0.515	0.00
2045	21	0.00	0.498	0.00
2046	22	0.00	0.482	0.00
2047	23	0.00	0.466	0.00
2048	24	0.00	0.451	0.00
2049	25	0.00	0.436	0.00
2050	26	0.00	0.422	0.00
2051	27	0.00	0.408	0.00
2052	28	0.00	0.395	0.00
2053	29	0.00	0.382	0.00
2054	30	0.00	0.369	0.00
2055	31	0.00	0.357	0.00
2056	32	0.00	0.346	0.00
2057	33	0.00	0.334	0.00
2058	34	0.00	0.323	0.00
2059	35	0.00	0.313	0.00
2060	36	0.00	0.303	0.00
2061	37	0.00	0.293	0.00
2062	38	0.00	0.283	0.00
2063	39	0.00	0.274	0.00
2064	40	0.00	0.265	0.00
2065	41	0.00	0.256	0.00
2066	42	0.00	0.248	0.00
2067	43	2.06	0.240	0.49
2068	44	2.06	0.232	0.48
2069	45	20.40	0.225	4.58
2070	46	20.40	0.217	4.43
2071	47	0.00	0.210	0.00
2072	48	0.00	0.203	0.00
2073	49	0.00	0.197	0.00
2074	50	0.00	0.190	0.00
		327.05		320.69

Interest Rate	0.03375	
Amortization	0.04168	
Interest During Construction		28.57
Average Annual Costs		13.37
O&M Costs		0.21
Total Average Annual Costs ($Millions)		13.57

Table 21 (cont.)
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.005 AEP for Alternative

Lake Charles Westbank Sulphur South

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	0.00	1.348	0.00
2016	-8	0.00	1.304	0.00
2017	-7	29.23	1.262	36.87
2018	-6	29.23	1.220	35.67
2019	-5	129.04	1.181	152.33
2020	-4	129.04	1.142	147.36
2021	-3	129.04	1.105	142.55
2022	-2	129.04	1.069	137.90
2023	-1	99.81	1.034	103.18
2024	0	99.81	1.000	99.81
2025	1	0.00	0.967	0.00
2026	2	0.00	0.936	0.00
2027	3	0.00	0.905	0.00
2028	4	0.00	0.876	0.00
2029	5	0.00	0.847	0.00
2030	6	0.00	0.819	0.00
2031	7	0.00	0.793	0.00
2032	8	0.00	0.767	0.00
2033	9	0.00	0.742	0.00
2034	10	0.00	0.718	0.00
2035	11	0.00	0.694	0.00
2036	12	0.00	0.671	0.00
2037	13	0.00	0.650	0.00
2038	14	0.00	0.628	0.00
2039	15	0.00	0.608	0.00
2040	16	0.00	0.588	0.00
2041	17	0.00	0.569	0.00
2042	18	0.00	0.550	0.00
2043	19	0.00	0.532	0.00
2044	20	0.00	0.515	0.00
2045	21	0.00	0.498	0.00
2046	22	0.00	0.482	0.00
2047	23	0.00	0.466	0.00
2048	24	0.00	0.451	0.00
2049	25	0.00	0.436	0.00
2050	26	0.00	0.422	0.00
2051	27	0.00	0.408	0.00
2052	28	0.00	0.395	0.00
2053	29	0.00	0.382	0.00
2054	30	0.00	0.369	0.00
2055	31	0.00	0.357	0.00
2056	32	0.00	0.346	0.00
2057	33	0.00	0.334	0.00
2058	34	0.00	0.323	0.00
2059	35	0.00	0.313	0.00
2060	36	0.00	0.303	0.00
2061	37	0.00	0.293	0.00
2062	38	0.00	0.283	0.00
2063	39	0.00	0.274	0.00
2064	40	0.00	0.265	0.00
2065	41	0.00	0.256	0.00
2066	42	0.00	0.248	0.00
2067	43	5.03	0.240	1.21
2068	44	5.03	0.232	1.17
2069	45	33.22	0.225	7.46
2070	46	33.22	0.217	7.22
2071	47	33.22	0.210	6.98
2072	48	0.00	0.203	0.00
2073	49	0.00	0.197	0.00
2074	50	0.00	0.190	0.00
		883.94		879.70

Interest Rate	0.03375	
Amortization	0.04168	
Interest During Construction		81.44
Average Annual Costs		36.66
O&M Costs		0.44
Total Average Annual Costs ($Millions)		37.11

Table 21 (cont.)
Southwest Coastal, LA Feasibility Study
Average Annual Costs for the 0.005 AEP for Alternative

Lake Charles Eastbank

Year	Period of Analysis	Construction Costs ($ millions)	PV Factor	Present Value of Construction Costs ($ millions)
2015	-9	0.00	1.393	0.00
2016	-8	0.00	1.342	0.00
2017	-7	78.55	1.294	101.64
2018	-6	78.55	1.247	97.97
2019	-5	211.79	1.202	254.60
2020	-4	211.79	1.159	245.39
2021	-3	211.79	1.117	236.52
2022	-2	211.79	1.076	227.97
2023	-1	109.78	1.038	113.89
2024	0	109.78	1.000	109.78
2025	1	0.00	0.964	0.00
2026	2	0.00	0.929	0.00
2027	3	0.00	0.895	0.00
2028	4	0.00	0.863	0.00
2029	5	0.00	0.832	0.00
2030	6	0.00	0.802	0.00
2031	7	0.00	0.773	0.00
2032	8	0.00	0.745	0.00
2033	9	0.00	0.718	0.00
2034	10	0.00	0.692	0.00
2035	11	0.00	0.667	0.00
2036	12	0.00	0.643	0.00
2037	13	0.00	0.620	0.00
2038	14	0.00	0.597	0.00
2039	15	0.00	0.576	0.00
2040	16	0.00	0.555	0.00
2041	17	0.00	0.535	0.00
2042	18	0.00	0.515	0.00
2043	19	0.00	0.497	0.00
2044	20	0.00	0.479	0.00
2045	21	0.00	0.462	0.00
2046	22	0.00	0.445	0.00
2047	23	0.00	0.429	0.00
2048	24	0.00	0.413	0.00
2049	25	0.00	0.398	0.00
2050	26	0.00	0.384	0.00
2051	27	0.00	0.370	0.00
2052	28	0.00	0.357	0.00
2053	29	0.00	0.344	0.00
2054	30	0.00	0.331	0.00
2055	31	0.00	0.319	0.00
2056	32	0.00	0.308	0.00
2057	33	0.00	0.297	0.00
2058	34	0.00	0.286	0.00
2059	35	0.00	0.276	0.00
2060	36	0.00	0.266	0.00
2061	37	0.00	0.256	0.00
2062	38	0.00	0.247	0.00
2063	39	0.00	0.238	0.00
2064	40	0.00	0.229	0.00
2065	41	0.00	0.221	0.00
2066	42	0.00	0.213	0.00
2067	43	5.98	0.205	1.23
2068	44	5.98	0.198	1.18
2069	45	39.48	0.191	7.53
2070	46	39.48	0.184	7.26
2071	47	39.48	0.177	7.00
2072	48	0.00	0.171	0.00
2073	49	0.00	0.165	0.00
2074	50	0.00	0.159	0.00
		1354.22		1,411.97

Interest Rate	0.03375	
Amortization	0.04168	
Interest During Construction		163.94
Average Annual Costs		58.85
O&M Costs		0.60
Total Average Annual Costs ($Millions)		59.45

Note: Includes Mitigation costs.

Table 22
Southwest Coastal, LA Feasibility Study
0.02 AEP (50-year) Abbeville to Delcambre Alternative Total Equivalent Annual Net Benefits
(FY 2015 Price Level; 3.375% Discount Rate)
(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	73.7	52.4	21.3
First Costs			726.3
Interest During Construction			75.1
Annual Operation & Maintenance Costs			0.51
Total Annual Costs			33.3
Benefit Cost Ratio			0.64
Equivalent Annual Net Benefits - 2025 Base Year			-12.00

Note: Mitigation is not included in the cost estimates

Table 23
Southwest Coastal, LA Feasibility Study
0.02 AEP (50-year) Delcambre/Erath Alternative Total Equivalent Annual Net Benefits
(FY 2015 Price Level; 3.375% Discount Rate)
(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	36.7	23.1	13.6
First Costs			359.4
Interest During Construction			34.4
Annual Operation & Maintenance Costs			0.24
Total Annual Costs			15.1
Benefit Cost Ratio			0.90
Equivalent Annual Net Benefits - 2025 Base Year			-1.52

Note: Mitigation is not included in the cost estimates

Table 24

Southwest Coastal, LA Feasibility Study

0.02 AEP (50-year) Abbeville Ring Levee Total Equivalent Annual Net Benefits

(FY 2015 Price Level; 3.375% Discount Rate)

(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	10.6	9.3	1.3
First Costs			286.0
Interest During Construction			28.8
Annual Operation & Maintenance Costs			0.28
Total Annual Costs			12.6
Benefit Cost Ratio			0.10
Equivalent Annual Net Benefits - 2025 Base Year			-11.26

Note: Mitigation is not included in the cost estimates

Table 25

Southwest Coastal, LA Feasibility Study

0.02 AEP (50-year) Lake Charles Westbank Sulfur Extended Total Equivalent Annual Net Benefits

(FY 2015 Price Level; 3.375% Discount Rate)

(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	10.3	10.2	0.1
First Costs			142.8
Interest During Construction			14.1
Annual Operation & Maintenance Costs			0.21
Total Annual Costs			6.3
Benefit Cost Ratio			0.02
Equivalent Annual Net Benefits - 2025 Base Year			-6.20

Note: Mitigation is not included in the cost estimates

Table 26

Southwest Coastal, LA Feasibility Study

0.02 AEP (50-year) Lake Charles Westbank Sulfur South Total Equivalent Annual Net Benefits

(FY 2015 Price Level; 3.375% Discount Rate)

(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	20.1	18.2	1.9
First Costs			456.3
Interest During Construction			47.5
Annual Operation & Maintenance Costs			0.44
Total Annual Costs			20.2
Benefit Cost Ratio			0.09
Equivalent Annual Net Benefits - 2025 Base Year			-18.26

Note: Mitigation is not included in the cost estimates

Table 27

Southwest Coastal, LA Feasibility Study

0.02 AEP (50-year) Lake Charles Eastbank Total Equivalent Annual Net Benefits

(2014 Price Level; 3.375% Discount Rate)

(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	167.9	137.1	30.8
First Costs			815.6
Interest During Construction			98.7
Annual Operation & Maintenance Costs			0.60
Total Annual Costs			36.5
Benefit Cost Ratio			0.84
Equivalent Annual Net Benefits - 2025 Base Year			-5.66

Note: Mitigation is not included in the cost estimates

Table 28

Southwest Coastal, LA Feasibility Study

0.01 AEP (100-year) Abbeville to Delcambre Alternative Total Equivalent Annual Net Benefits

(FY 2015 Price Level; 3.375% Discount Rate)

(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	73.7	42.1	31.6
First Costs			885.2
Interest During Construction			89.5
Annual Operation & Maintenance Costs			0.56
Total Annual Costs			40.3
Benefit Cost Ratio			0.78
Equivalent Annual Net Benefits - 2025 Base Year			-8.77

Note: Mitigation is not included in the cost estimates

Table 29

Southwest Coastal, LA Feasibility Study

0.01 AEP (100-year) Delcambre/Erath Alternative Total Equivalent Annual Net Benefits

(FY 2015 Price Level; 3.375% Discount Rate)

(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	36.7	17.7	19.0
First Costs			470.8
Interest During Construction			43.9
Annual Operation & Maintenance Costs			0.24
Total Annual Costs			19.8
Benefit Cost Ratio			0.96
Equivalent Annual Net Benefits - 2025 Base Year			-0.83

Note: Mitigation is not included in the cost estimates

Table 30

Southwest Coastal, LA Feasibility Study

0.01 AEP (100-year) Abbeville Ring Levee Total Equivalent Annual Net Benefits

(FY 2015 Price Level; 3.375% Discount Rate)

(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	10.6	6.7	3.9
First Costs			344.1
Interest During Construction			33.7
Annual Operation & Maintenance Costs			0.28
Total Annual Costs			15.0
Benefit Cost Ratio			0.26
Equivalent Annual Net Benefits - 2025 Base Year			-11.11

Note: Mitigation is not included in the cost estimates

Table 31

Southwest Coastal, LA Feasibility Study

0.01 AEP (100-year) Lake Charles Westbank Sulfur Extended Total Equivalent Annual Net Benefits

(FY 2015 Price Level; 3.375% Discount Rate)

(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	10.3	8.0	2.3
First Costs			199.3
Interest During Construction			18.1
Annual Operation & Maintenance Costs			0.21
Total Annual Costs			8.4
Benefit Cost Ratio			0.28
Equivalent Annual Net Benefits - 2025 Base Year			-6.06

Note: Mitigation is not included in the cost estimates

Table 32

Southwest Coastal, LA Feasibility Study

0.01 AEP (100-year) Lake Charles Westbank Sulfur South Total Equivalent Annual Net Benefits

(FY 2015 Price Level; 3.375% Discount Rate)

(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	20.1	15.1	4.9
First Costs			629.1
Interest During Construction			60.9
Annual Operation & Maintenance Costs			0.44
Total Annual Costs			26.9
Benefit Cost Ratio			0.18
Equivalent Annual Net Benefits - 2025 Base Year			-21.99

Note: Mitigation is not included in the cost estimates

Table 33

Southwest Coastal, LA Feasibility Study

0.01 AEP (100-year) Lake Charles Eastbank Total Equivalent Annual Net Benefits

(FY 2015 Price Level; 3.375% Discount Rate)

(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	167.9	118.8	49.1
First Costs			1109.2
Interest During Construction			141.1
Annual Operation & Maintenance Costs			0.60
Total Annual Costs			49.30
Benefit Cost Ratio			0.996
Equivalent Annual Net Benefits - 2025 Base Year			-0.219

Note: Mitigation costs are included in the 0.01 AEP (100-year) Lake Charles Eastbank cost estimate.

Table 34
Southwest Coastal, LA Feasibility Study
0.005 AEP (200-year) Abbeville to Delcambre Alternative Total Equivalent Annual Net Benefits
(FY 2015 Price Level; 3.375% Discount Rate)
(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Category			
Residential & Commercial - Structure/Content/Vehicles	73.7	35.6	38.1
First Costs			1117.9
Interest During Construction			110.9
Annual Operation & Maintenance Costs			0.56
Total Annual Costs			50.7
B/C Ratio			0.75
Equivalent Annual Net Benefits - 2025 Base Year			-12.62

Note: Mitigation is not included in the cost estimates

Table 35
Southwest Coastal, LA Feasibility Study
0.005 AEP (200-year) Delcambre/Erath Alternative Total Equivalent Annual Net Benefits
(FY 2015 Price Level; 3.375% Discount Rate)
(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	36.7	15.9	20.8
First Costs			589.5
Interest During Construction			54.1
Annual Operation & Maintenance Costs			0.24
Total Annual Costs			24.8
Benefit Cost Ratio			0.84
Equivalent Annual Net Benefits - 2025 Base Year			-4.00

Note: Mitigation is not included in the cost estimates

Table 36

Southwest Coastal, LA Feasibility Study

0.005 AEP (200-year) Abbeville Ring Levee Total Equivalent Annual Net Benefits

(FY 2015 Price Level; 3.375% Discount Rate)

(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	10.6	5.7	4.9
First Costs			447.7
Interest During Construction			42.7
Annual Operation & Maintenance Costs			0.28
Total Annual Costs			19.4
Benefit Cost Ratio			0.25
Equivalent Annual Net Benefits - 2025 Base Year			-14.46

Note: Mitigation is not included in the cost estimates

Table 37

Southwest Coastal, LA Feasibility Study

0.005 AEP (200-year) Lake Charles Westbank Sulfur Extended Total Equivalent Annual Net Benefits

(FY 2015 Price Level; 3.375% Discount Rate)

(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	10.3	7.8	2.5
First Costs			327.1
Interest During Construction			28.6
Annual Operation & Maintenance Costs			0.21
Total Annual Costs			13.6
Benefit Cost Ratio			0.19
Equivalent Annual Net Benefits - 2025 Base Year			-11.03

Note: Mitigation is not included in the cost estimates

Table 38

Southwest Coastal, LA Feasibility Study

0.005 AEP (200-year) Lake Charles Westbank Sulfur South Total Equivalent Annual Net Benefits

(FY 2015 Price Level; 3.375% Discount Rate)

(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	20.1	12.8	7.2
First Costs			883.9
Interest During Construction			81.4
Annual Operation & Maintenance Costs			0.44
Total Annual Costs			37.1
Benefit Cost Ratio			0.20
Equivalent Annual Net Benefits - 2025 Base Year			-29.86

Note: Mitigation is not included in the cost estimates

Table 39

Southwest Coastal, LA Feasibility Study

0.005 AEP (200-year) Lake Charles Eastbank Total Equivalent Annual Net Benefits

(FY 2015 Price Level; 3.375% Discount Rate)

(Costs and Benefits $ Millions)

Item	Equiv Annual W/O Project Damages (2025-2075)	Equiv Annual With-Project Damages (2025-2075)	Equiv Annual Benefits (2025-2075)
Damage Categories			
Residential & Commercial - Structure/Content/Vehicles	167.9	112.5	55.4
First Costs			1354.2
Interest During Construction			163.9
Annual Operation & Maintenance Costs			0.60
Total Annual Costs			59.5
Benefit Cost Ratio			0.93
Equivalent Annual Net Benefits - 2025 Base Year			-4.07

Note: Mitigation costs are included in the 0.005 AEP (200-Year) Lake Charles cost estimate.

Table 40
Southwest Coastal, LA Feasibility Study
Cost per Square Foot of Elevating Residential Structures
(2012 Price Level)
(In Dollars)

	1STY-SLAB			2STY-SLAB			1STY-PIER			2STY-PIER			MOBHOM		
Ft. Raised	Min	Most Likely	Max	Min	Most Likely	Max	Min	Most Likely	Max	Min	Most Likely	Max	Min	Most Likely	Max
1	62	70	77	70	77	85	54	62	69	61	68	76	30	34	38
2	62	70	77	70	77	85	54	62	69	61	68	76	30	34	38
3	64	71	79	71	79	86	57	64	72	63	71	78	30	34	38
4	66	74	81	76	84	91	57	64	72	63	71	78	30	34	38
5	66	74	81	76	84	91	57	64	72	63	71	78	38	42	45
6	68	75	83	78	85	93	58	66	73	65	72	80	38	42	45
7	68	75	83	78	85	93	58	66	73	65	72	80	38	42	45
8	70	78	85	80	88	96	60	67	75	66	74	81	38	42	45
9	70	78	85	80	88	96	60	67	75	66	74	81	38	42	45
10	70	78	85	80	88	96	60	67	75	66	74	81	38	42	45
11	70	78	85	80	88	96	60	67	75	66	74	81	38	42	45
12	70	78	85	80	88	96	60	67	75	66	74	81	38	42	45
13	73	80	88	85	93	101	61	69	76	68	75	83	38	42	45

Table 41
Southwest Coastal, LA Feasibility Study
Average Footprint of Structure by Category

Structure Category	Average Footprint (sq. ft.)
One story Pier	1,479
One story slab	2,031
Two story pier	1,328
Two story slab	1,788
Mobile home	576
Eatery	5,972
Grocery	6,362
Multi-Occupancy	38,321
Professional	6,190
Public	7,970
Repair	5,772
Retail	11,408
Warehouse	6,297

Note: Calculated from collected structure inventory.

Table 42
Southwest Coastal, LA Feasibility Study
Unit Cost of Nonstructural Measures
(2012 Price Level)
(In Dollars)

Floodproofing Cost		Warehouse Berms		Acquisitions		Structure Raising	
Square Feet of Structure	Cost per Structure	Real Estate Administrative Cost	$10,000	The Depreciated Replacement Value of Each Structure		Real Estate Administrative Cost	$ 10,000
< 20k	$ 98,922						
20-100k	306,452	Buffer:	160 Linear Feet	Real Estate Administrative Cost	$ 30,000	Temporary Relocation Cost	$ 6,148
> 100k	772,158	Cost per Linear Foot:	$780	Relocation Assistance Cost	$ 60,000	Cost per square foot of raising times the square footage of the structure	
Real Estate Administrative Cost	$ 10,000	Perimeter of wareouse plus buffer times cost per linear foot		Land Value	$ 70,000		

Sources: Donaldsonville-to-the-Gulf, Feasibilty Study and Real Estate Division, New Orleans District.

Table 43a
Southwest Coastal, LA Feasibility Study
Floodplain Summary
$1000s

Floodplain		Complete Study Area	0 to 100 year	50 to 100 year	25 to 50 year	0 to 25 year
Without Project Damages	$	460,748	323,846	22,015	29,542	272,288
Total Number of Structures		51,857	15,667	6,499	4,216	4,952
Residential Structures		46,860	13,934	5,904	3,811	4,219
Non-Residential Structures		3,432	1,003	398	209	396
Warehouses		1,565	730	197	196	337

Notes:
1. For the complete study area, without-project damages represent equivalent annual damages for the period 2025-2075, and adjusted to 2012 price levels.
2. For the indicated flood zones, without-project damages represent expected annual damages under 2025 hydrologic conditions only at 2012 price levels.

Table 43b
Southwest Coastal, LA Feasibility Study
With-Project Damages and Benefits
2012 Price Level
$1000s

FY15 3.375% Discount Rate

Floodplain	50 to 100 year	25 to 50 year	0 to 25 year	Total
Without-Project Damages	22,015	29,542	272,288	323,846
With-Project Damages	5,454	5,547	16,775	27,776
Project Benefits	16,562	23,995	255,513	296,070

OMB 7% Discount Rate

Floodplain	50 to 100 year	25 to 50 year	0 to 25 year	Total
Without-Project Damages	19,391	27,130	265,295	311,816
With-Project Damages	4,326	4,634	14,894	23,853
Project Benefits	15,065	22,496	250,401	287,963

Table 43c
Southwest Coastal, LA Feasibility Study
First Cost and Averge Annual Cost
2012 Price Level; FY15 3.375% Discount Rate
$1000s

FY15 3.375% Discount Rate

Floodplain	50 to 100 year	25-50 year	0-25 year
First Cost	879,889	558,689	791,647
Average Annual Cost	36,671	23,284	32,993

OMB 7% Discount Rate

Floodplain	50 to 100 year	25-50 year	0-25 year
First Cost	879,889	558,689	791,647
Average Annual Cost	$66,364	$42,138	$59,709

Table 43d
Southwest Coastal, LA Feasibility Study
Net Benefit Analysis
FY 2015 Price Level; FY15 3.375% Discount Rate
$1000s

FY15 3.375% Discount Rate

Floodplain	50 to 100 year	25 to 50 year	0 to 25 year
First Cost	915,876.78	581,538.88	824,025.22
Project Benefits	17,239.18	24,976.54	265,963.65
Average Annual Cost	38,171.09	24,236.68	34,342.49
Net Benefits	(20,931.92)	739.86	231,621.16
B/C Ratio	0.45	1.03	7.74

OMB 7% Discount Rate

Floodplain	50 to 100 year	25 to 50 year	0 to 25 year
First Cost	915,876.78	581,538.88	824,025.22
Project Benefits	15,065	22,496	250,401
Average Annual Cost	$66,364.29	42,138.22	59,708.74
Net Benefits	(51,299.25)	(19,641.80)	231,621.16
B/C Ratio	0.23	0.53	4.19

Table 44
Southwest Coastal, LA Feasibility Study
Risk Analysis
Probability that Equivalent Annual Benefits Exceed Annual Costs
2012 Price Level; FY15 3.375% Discount Rate

$1000s

		Probabilty Damage Reduced Exceeds				
Component	Equivalent Annual Damages Reduced	0.75	0.50	0.25	Annual Costs	Probabilty Benefits Exceed Costs
Nonstructural Measures 0-25 Year Floodplain (2025)	255,513	207,495	251,952	298,406	32,993	Greater than 75 percent
Nonstructural Measures 25-50 Year Floodplain (2025)	23,995	16,530	22,321	29,640	23,284	Between 25 and 50 percent
Nonstructural Measures 50-100 Year Floodplain (2025)	16,562	10,847	15,465	20,953	36,671	Less than 25 percent

Table 45
Southwest Coastal, LA Feasibility Study
Final Array of Alternatives for National Ecosystem Restoration

PLAN NUMBER	Alternative
A	Entry Salinity Control
C-1	Calcasieu Large Integrated Restoration
C-2	Calcasieu Moderate Integrated Restoration
C-3	Calcasieu Moderate Integrated Restoration
C-4	Calcasieu Small Integrated Restoration
C-5	Calcasieu Interior Perimeter Salinity Control
C-6	Calcasieu Marsh & Shoreline
CA-1	Calcasieu Large Integrated Restoration w/ Entry Salinity Control
CA-2	Calcasieu Moderate Integrated Restoration w/ Entry Salinity Control
CA-3	Calcasieu Moderate Integrated Restoration w/ Gum Cove & Entry Salinity Control
CA-4	Calcasieu Small Integrated Restoration w/ Entry Salinity Control
CM-1	Comprehensive Large Integrated Restoration
CM-2	Comprehensive Moderate Integrated Restoration
CM-3	Comprehensive Moderate Integrated Restoration
CM-4	Comprehensive Small Integrated Restoration
CM-5	Comprehensive Interior Perimeter Salinity Control
CM-6	Comprehensive Marsh & Shoreline
CMA-1	Comprehensive Large Integrated Restoration w/ Entry Salinity Control
CMA-2	Comprehensive Moderate Integrated Restoration w/ Entry Salinity Control
CMA-3	Comprehensive Moderate Integrated Restoration w/ Gum Cove & Entry Salinity Control
CMA-4	Comprehensive Small Integrated Restoration w/ Entry Salinity Control
M-1	Mermentau Large Integrated Restoration
M-2	Mermentau Moderate Integrated Restoration
M-3	Mermentau Moderate Integrated Restoration
M-4	Mermentau Small Integrated Restoration
M-5	Mermentau Interior Perimeter Salinity Control
M-6	Mermentau Marsh & Shoreline

Table 46
Southwest Coastal, LA Feasibility Study
Costs and Net AAHUs
Without Negative Measures

Plan	AA Cost (1,000$)	Net AAHUs
A	25,437	995
C-1	34,344	4,682
C-2	30,790	4,242
C-3	42,615	4,422
C-4	16,039	2,353
C-5	27,863	2,533
C-6	34,344	4,682
CA-1	59,781	5,678
CA-2	56,228	5,237
CA-3	68,052	5,417
CA-4	41,476	3,349
CM-1	89,339	9,548
CM-2	65,686	8,038
CM-3	77,511	8,218
CM-4	48,633	5,901
CM-5	60,458	6,080
CM-6	83,973	9,333
CMA-1	114,776	10,543
CMA-2	91,124	9,033
CMA-3	102,948	9,213
CMA-4	74,071	6,896
M-1	54,995	4,865
M-2	34,896	3,795
M-3	34,896	3,795
M-4	32,595	3,547
M-5	32,595	3,547
M-6	49,628	4,651

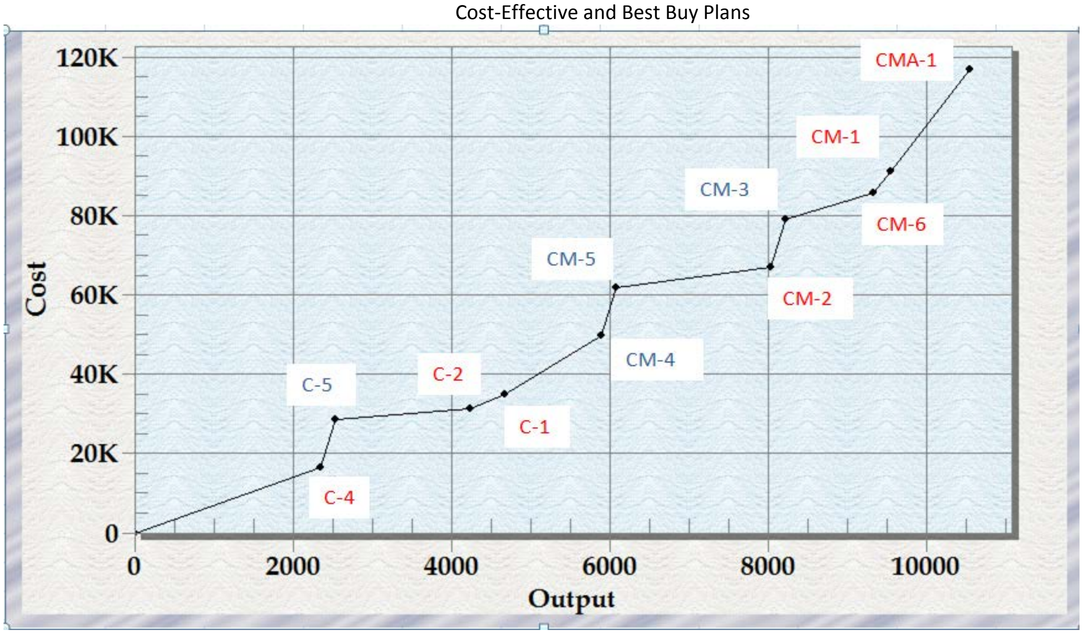
Note: Average Annual Cost estimates include construction cost, O&M, and construction. PED, LERRDS, construction management, and monitoring adaptive management costs are not included.

Table 47
Southwest Coastal, LA Feasibility Study
Best Buys and Cost-Effective Plans
Incremental Cost Analysis Results

Name	AA Cost (1000$)	Net AAHUs	Cost Effective
CMA-1	114,776	10,543	Yes/Best Buy
CM-1	89,339	9,548	Yes/Best Buy
CM-6	83,973	9,333	Yes/Best Buy
CM-3	77,511	8,218	Yes
CM-2	65,686	8,038	Yes/Best Buy
CM-5	60,458	6,080	Yes
CM-4	48,633	5,901	Yes
C-1	34,344	4,682	Yes/Best Buy
C-2	30,790	4,242	Yes/Best Buy
C-5	27,863	2,533	Yes
C-4	16,039	2,353	Yes/Best Buy

Plan	Net AAHUs (Output)	AA Cost	Average Cost	Incremental Cost	Incremental Output	Inc. Cost Per Inc. Output
C-4	2,353	16,039	6.81	16,039	2,353	6.81
C-2	4,242	30,790	7.26	14,752	1,889	7.81
C-1	4,682	34,344	7.33	3,554	440	8.07
CM-2	8,038	65,686	8.17	31,342	3,355	9.34
CM-6	9,333	83,973	9.00	18,286	1,296	14.11
CM-1	9,548	89,339	9.36	5,366	214	25.03
CMA-1	10,543	114,776	10.89	25,437	995	25.55

Figure 1
Southwest Coastal, LA Feasibility Study
Cost-Effective and Best Buy Plans



Plans in Blue are cost effective; plans in red are best buys.

Figure 2
Southwest Coastal, LA Feasibility Study
Incremental Cost Per Unit of Output

Table 48
Southwest Coastal, LA Feasibility Study
Construction Cost Schedule (CM-4)

Year	Period of Analysis	Construction Costs	PV Factor	Construction Costs
2022	-2	$ 206,007,000	1.0686	$220,147,000
2023	-1	$ 491,949,000	1.0338	$508,552,000
2024	0	$ 289,782,000	1.0000	$289,782,000
2025	1	$0	0.9674	0
2026	2	$0	0.9358	0
2027	3	$0	0.9052	0
2028	4	$0	0.8757	0
2029	5	$0	0.8471	0
2030	6	$0	0.8194	0
2031	7	$0	0.7927	0
2032	8	$0	0.7668	0
2033	9	$0	0.7418	0
2034	10	$0	0.7175	0
2035	11	$0	0.6941	0
2036	12	$0	0.6715	0
2037	13	$0	0.6495	0
2038	14	$0	0.6283	0
2039	15	$0	0.6078	0
2040	16	$0	0.5880	0
2041	17	$0	0.5688	0
2042	18	$0	0.5502	0
2043	19	$0	0.5322	0
2044	20	$0	0.5149	0
2045	21	$0	0.4981	0
2046	22	$0	0.4818	0
2047	23	$0	0.4661	0
2048	24	$0	0.4508	0
2049	25	$0	0.4361	0
2050	26	$0	0.4219	0
2051	27	$0	0.4081	0
2052	28	$0	0.3948	0
2053	29	$0	0.3819	0
2054	30	$0	0.3694	0
2055	31	$0	0.3574	0
2056	32	$0	0.3457	0
2057	33	$0	0.3344	0
2058	34	$0	0.3235	0
2059	35	$0	0.3129	0
2060	36	$0	0.3027	0
2061	37	$0	0.2928	0
2062	38	$0	0.2833	0
2063	39	$0	0.2740	0
2064	40	$0	0.2651	0
2065	41	$0	0.2564	0
2066	42	$0	0.2481	0
2067	43	$0	0.2400	0
2068	44	$0	0.2321	0
2069	45	$0	0.2245	0
2070	46	$0	0.2172	0
2071	47	$0	0.2101	0
2072	48	$0	0.2033	0
2073	49	$0	0.1966	0
2074	50	$0	0.1902	0
Total		$ 987,738,000		$1,018,481,000

Table 48
Southwest Coastal, LA Feasibility Study
O&M Schedule (CM-4)

Year	Period of Analysis	Construction Costs	PV Factor	PV Construction Costs
2022	-2		1.0686	0
2023	-1		1.0338	0
2024	0		1.0000	0
2025	1	-	0.9674	0
2026	2	-	0.9358	0
2027	3	-	0.9052	0
2028	4	-	0.8757	0
2029	5	-	0.8471	0
2030	6	-	0.8194	0
2031	7	-	0.7927	0
2032	8	-	0.7668	0
2033	9	-	0.7418	0
2034	10	-	0.7175	0
2035	11	$26,856,000	0.6941	18,641,000
2036	12	-	0.6715	0
2037	13	-	0.6495	0
2038	14	-	0.6283	0
2039	15	-	0.6078	0
2040	16	-	0.5880	0
2041	17	-	0.5688	0
2042	18	-	0.5502	0
2043	19	-	0.5322	0
2044	20	-	0.5149	0
2045	21	56,172,000	0.4981	27,977,000
2046	22	-	0.4818	0
2047	23	-	0.4661	0
2048	24	-	0.4508	0
2049	25	-	0.4361	0
2050	26	225,418,000	0.4219	95,101,000
2051	27	16,433,000	0.4081	6,707,000
2052	28	-	0.3948	0
2053	29	-	0.3819	0
2054	30	-	0.3694	0
2055	31	-	0.3574	0
2056	32	-	0.3457	0
2057	33	-	0.3344	0
2058	34	-	0.3235	0
2059	35	-	0.3129	0
2060	36	-	0.3027	0
2061	37	-	0.2928	0
2062	38	-	0.2833	0
2063	39	-	0.2740	0
2064	40	-	0.2651	0
2065	41	-	0.2564	0
2066	42	-	0.2481	0
2067	43	-	0.2400	0
2068	44	-	0.2321	0
2069	45	-	0.2245	0
2070	46	-	0.2172	0
2071	47	-	0.2101	0
2072	48	-	0.2033	0
2073	49	-	0.1966	0
2074	50	-	0.1902	0
Total		324,879,000		148,426,000

Table 48

(Continued)

Navigation Delay Cost For NER Plans

Port of Lake Charles - 2011 WCSC Data

	Low Scenario		High Scenario	
	Self-Propelled Dry Cargo	**Self-Propelled Tanker**	**Self-Propelled Dry Cargo**	**Self-Propelled Tanker**
	All Traffic Directions	All Traffic Directions	All Traffic Directions	All Traffic Directions
15-17 ft.	89	15	89	15
18-20 ft.	127	47	127	47
21-23 ft.	84	118	84	118
24-26 ft.	70	98	70	98
27-29 ft.	67	316	67	316
30-32 ft.	43	159	43	159
33-35 ft.	25	147	25	147
36-38 ft.	0	0	50	144
39-40 ft.	0	0	33	178
41 ft.	0	0	0	2

	Low Scenario: Bulkers	Low Scenario: Tankers	High Scenario: Bulkers	High Scenario: Tankers
2011 Deep Draft Traffic	**505**	**900**	**588**	**1,224**
Affected Traffic (12 hrs)	252.5	450	294	612
Hrs of Expected Delay	6.00	6.00	6.00	6.00
Vessel Operating Cost\Hour	$1,500	$2,000	$1,500	$2,000
Total Delay Cost by Vessel Type	**$2,272,500**	**$5,400,000**	**$2,646,000**	**$7,344,000**

Combined Avg Ann Total Delay Cost	**$7,672,500**	**$9,990,000**

Table 49
Southwest Coastal, LA Feasibility Study
Average Annual Cost of the TSP (CM-4)

Interest Rate		3.375%
Amortization Factor (Rounded)		0.04168
Construction Cost		$987,738,000
Interest During Construction		30,743,000
Total Implementation Cost		$1,018,481,000
O&M Cost		148,426,000
Average Annual Construction Cost		42,447,000
Average Annual O&M Cost		6,186,000
Total Average Annual Cost	$	48,633,000

Table 50

Southwest Coastal, LA Feasibility Study

Regional Economic Development Analysis (RED)

Impact Region Profile

County	FIPS	Area (sq. mi)	Population	Households	Total Personal Income (in millions)
Acadia	22001	657	61,376	22,377	$1,905
Calcasieu	22019	1,094	188,606	72,232	$6,796
Cameron	22023	1,642	7,597	2,782	$233
Jefferson Davis	22053	659	31,519	11,706	$989
Vermilion	22113	1,301	56,905	21,286	$1,731
Total		**5,353**	**346,003**	**130,383**	**$11,655**

Table 51
Southwest Coastal, LA Feasibility Study
Regional Economic Development Analysis (RED)
Summary of Impacts
NED TSP

Impact	Regional	State	National
		Direct Impact	
Output	$660,333,000	$744,510,000	$819,000,000
Job	10,000	11,000	12,000
Labor Income	$392,779,000	$432,323,000	$465,166,000
GRP	$463,510,000	$516,580,000	$556,135,000
		Secondary Impact	
Output	$344,177,000	$605,097,000	$1,390,755,000
Job	3,000	5,000	9,000
Labor Income	$109,232,000	$207,306,000	$460,665,000
GRP	$196,483,000	$353,819,000	$793,667,000
		Total Impact	
Output	$1,004,510,000	$1,349,607,000	$2,209,754,000
Job	13,000	16,000	21,000
Labor Income	$502,011,000	$639,629,000	$925,832,000
GRP	$659,994,000	$870,399,000	$1,349,802,000

NER TSP

Impact	Regional	State	National
		Direct Impact	
Output	$971,189,000	$981,153,000	$1,307,454,000
Job	9,000	9,000	14,000
Labor Income	$577,812,000	$586,585,000	$775,023,000
GRP	$603,774,000	$612,455,000	$814,158,000
		Secondary Impact	
Output	$599,652,000	$854,653,000	$2,447,847,000
Job	5,000	6,000	14,000
Labor Income	$183,545,000	$281,142,000	$779,414,000
GRP	$328,662,000	$475,174,000	$1,338,064,000
		Total Impact	
Output	$1,570,840,000	$1,835,806,000	$3,755,301,000
Job	14,000	16,000	28,000
Labor Income	$761,357,000	$867,727,000	$1,554,437,000
GRP	$932,436,000	$1,087,630,000	$2,152,222,000